

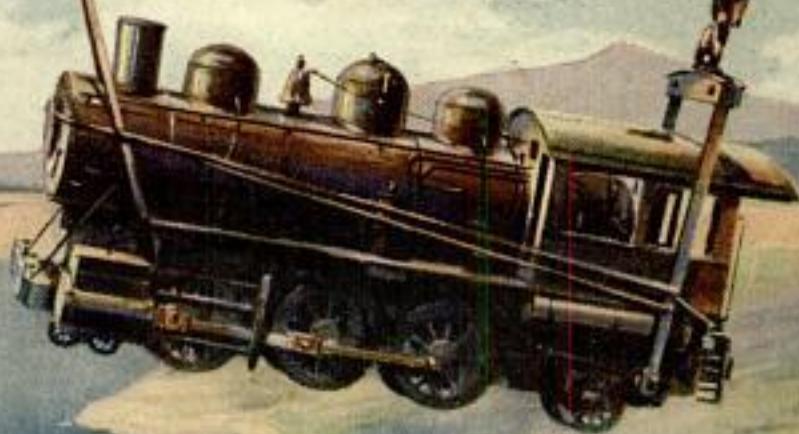
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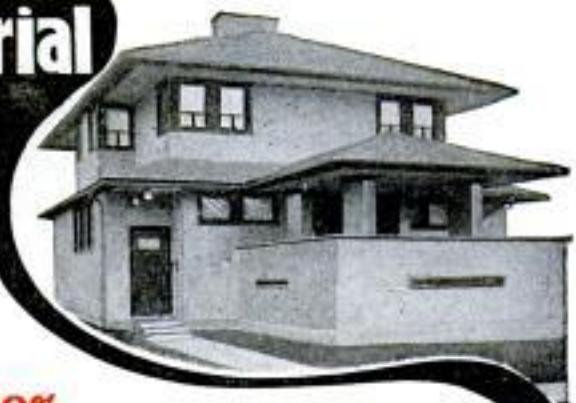
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318 W. Washington Street, Chicago, U. S. A.

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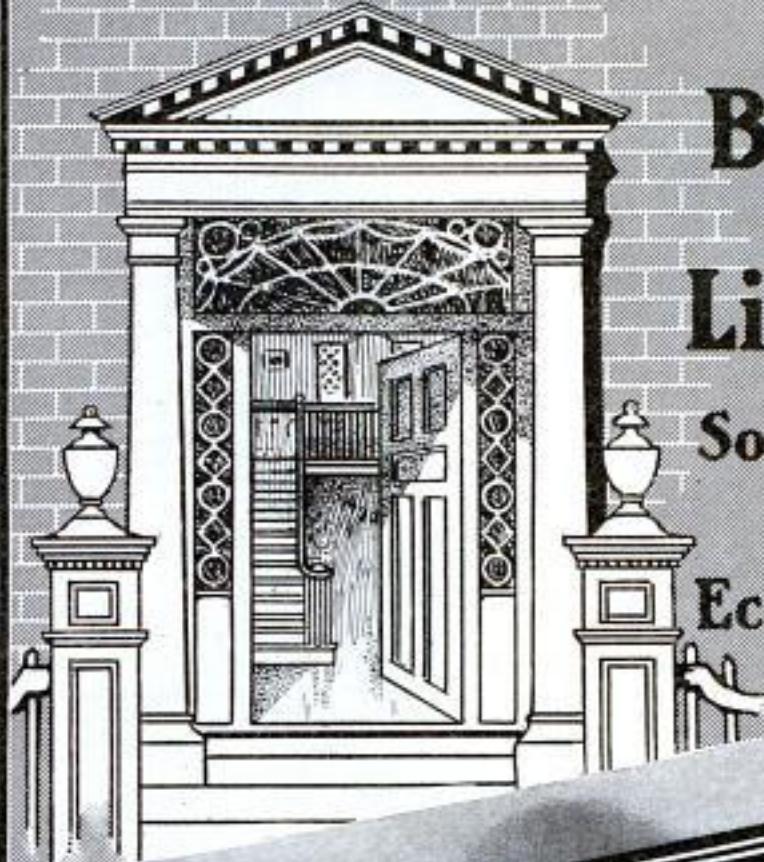
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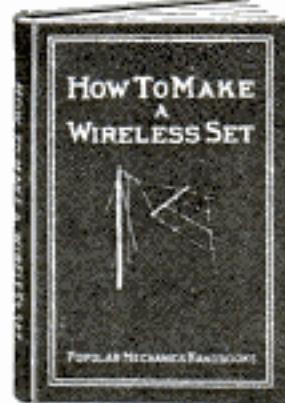
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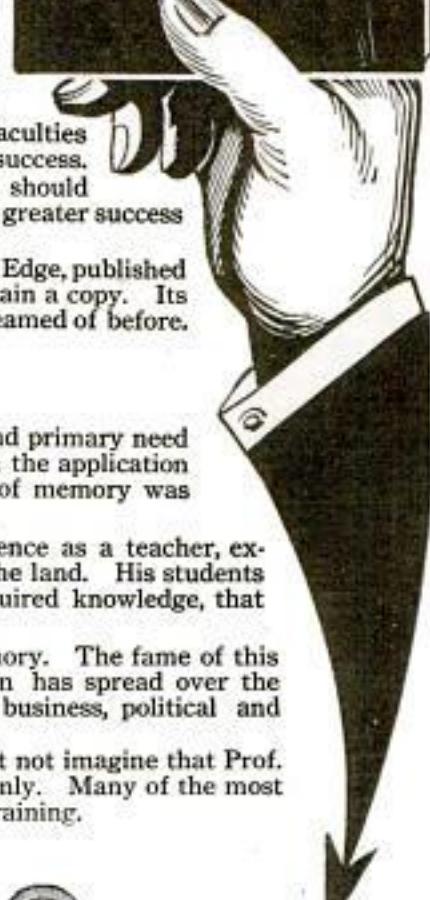
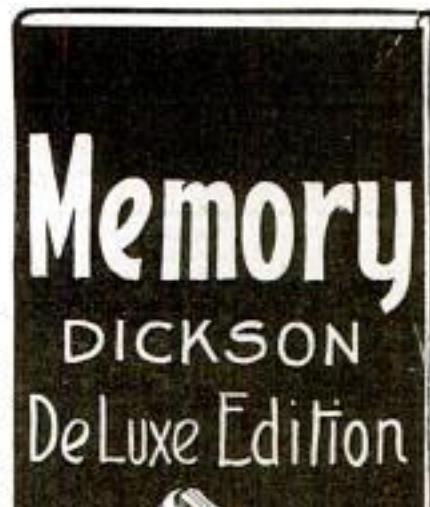
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A LIGHTNING seller. Needed in every home. Agent made \$37.50 one day. Particulars free. S. Q. Kline, 233 H St. North, Washington, D. C.

REPUBLICAN. Democratic Campaign Watch Fobs; whirlwind sellers. Samples ten cents with catalogue. Agents Winners. Paris Company, Melrose, Mass.

SIGN Agents—Painters: Something new and better. Altrato ready-made Gold and Silver Letters. 21 kinds, easily applied. Make big money lettering store windows and selling sparkling chipped glass nameplates. Catalogue and sample letter free. Altrato Sign Co., 2635 N. Clark St., Chicago.

PORTRAIT Agents, 10x20 crayon, sepia, pasteline, bromide, 40c. Big money in our convex portrait; delivery guaranteed or money back; portrait and frame catalogue and samples free. Siegfried Portrait Co., Dept. P. M. 3, 5219 Ellis Ave., Chicago.

WANTED—Local or Traveling Salesmen making small towns to handle our new, attractive, pocket sideline. Quick shipments, prompt commissions, no collecting. State territory covered. For particulars, address Peerless Mfg. Co., 216 Sibley St., Chicago, Ill.

Be our Sheet Music Salesman in your town; 100% profit. 3 sample copies late hits, 10c. Write for our liberator proposition. Addison, Crilly Bldg., Chicago.

CUT out fads and fancies. Handle a sensible line of patented household necessities. Send for catalogue and unique selling plan. Lyon-Edwood Mfg. Co., East St. Louis, Ill.

AMERICAN Lady Fibre Brooms—replace corn brooms everywhere. Guaranteed one year. Exclusive agency means a monopoly and life independence. For sixty cents I send sample, instructions and reserve territory. F. L. Hurt, 2255 S. State St., Chicago.

You can sell this Office Specialty—Demonstration—No talk does it. Sell from your pocket, easy and quickly. 200% profit. Winner for side line. Particulars free. Babbles Sons Company, Munroe, Indiana.

QUICK selling vacuum cleaner, powerful sweeper type, double suction; \$75 to \$100 weekly; exclusive territory, wholesale prices to hustlers. Varm Co., 1488 Security Bldg., Chicago.

WE furnish you capital to run a profitable business of your own. Become our local representative and sell guaranteed Sweaters, Shirts, Neckties, underwear and hose direct from our factories to the homes. Write. Steadfast Mills, Dept. 12, 17 Courtland St., Cohoes, N. Y.

AGENTS—Sign painters. Cost 2c, sell 25c. Something new. Guaranteed Sign Letters mounted with kerosene and roller. Grip outfit free. Boss Letter Co., 2497 Milwaukee Ave., Chicago.

AGENTS—Men or women to handle our supplies. All or spare time. Pleasant and very profitable. We gladly aid you to build up a good business; write us today. The Charles W. Reed Co., 805 East Capitol St., Washington, D. C.

AGENTS—Men and women. Be the first to sell Only Self Oiling Mop on market. Household necessity. Big money maker; write at once. Eureka Sales, 116 So. Michigan, Chicago.

AGENTS—No experience necessary to make big money every day with most useful article on the market; write today. Fisher Specialty Co., Box 422, Genesee, Ill.

STOP—Agents—Big money for you. 3 wonderful sellers; samples and particulars for life; act now. Novelties Company, Room 311, 219 S. Dearborn St., Chicago.

WE manufacture five fascinating gameboards; 100% profit; orders repeat; best side line with cigars, candy, etc. Particulars. Bechtler Game Co., Independence, Iowa.

AGENTS wanting big money quick; get the latest publication, "Stewart's secret formula and recipe book." Recipes that have made fortunes for the manufacturers. Books, \$1.50; send 50 cts. for original copy, every one wants it, \$2 an hour easy. Carlos Stewart, Chemical Specialist, Connersville, Ind.

BEAUTIFUL embossed gold window letters, make 100% profit without experience. Signs always needed. Ours last for years. Rock bottom prices. Essentials to work with mailed free. Embossed Letter Co., 2494 Milwaukee Ave., Chicago.

HUSTLING agents wanted everywhere, to sell our daily expense record. Everybody needs it, sells on merit, 100% profit. If you wish to earn \$25-\$30 per week, send 50 cents for sample and particulars. Southern Sales Co., Rome, Ga.

CANVASSERS to sell automatic Screen Door Catches; quick, easy sales, big profits; sample copy postpaid for 25¢ in stamps. You can have exclusive territory. Superior Door Catch Co., Superior, Wis.

YOU are looking for more long green. You doubtless deserve it, and willing to work for it. Our soap and toilet article combinations have every earmark of being the real Cola Gelters—we can prove that they are. Write for our convincing proofs. Davis Soap Works, 264 Davis Bldg., Chicago.

WANTED Agents—Boys and girls earn a gold ring by selling twenty packages of Chewing Gum. We send gum free with catalogue of presents. Write a posta today for gum. The Columbus Gum & Premium Company, P. O. Box 36 Station A, Columbus, Ohio.

AGENTS—140% profit selling Steel Wool Dish Cleaner. Large demand. Housekeepers say, "Superior to other cleaners." Test free sample and prove our statement. Write today. F. C. Hanson, Southbridge, Mass.

AGENTS—Make \$5 daily handling our up-to-date Door Plates, Name Plates, House Numbers, Signs, etc. Samples free. Brett Bros., Boston, Mass.

\$2.50 PER day. Paid one man or woman, in each town, to distribute free circulars and take orders for concentrated flavoring in tubes. Permanent position. J. S. Ziegler Co., 443-D Dearborn St., Chicago, Ill.

SWEEP in the \$ \$ \$ with our "Wunderbroom"—made of India Bassine. Superior to finest broom-corn. Absolutely new. C. Krebs, 2249 Archer, Chicago.

\$50 EASILY made is better than \$50 saved for. You've got the goods in Ortol Vacuum Cleaners. Demonstration makes a sale; works better than expensive machine. Write Park Specialty Co., Harris, Iowa.

TWO crackerjack sellers. Patent Retort Pipe Cleaner, Aluminum Plant or Clothes Sprinkler; samples 15¢, both 25¢; particulars free. George Hubert, Yonkers, N. Y.

AGENTS—Every smoker wants, and buys on sight, our self-lighting windproof cigar lighter; you can make big money selling them. No talking sells itself. Railbun M. Co., Indianapolis, Ind.

AGENTS—New fiber home broom; costs same as good broom; outlasts four. Sold only by agents. Guaranteed. Hiltner Mop Co., 1260 Grand Ave., Chicago.

FOR big money, nothing like our up-to-the-minute window letters. The Slann Sign System, Detroit, Mich.

AGENTS—Cost 2¢, sell 25¢. Window letters you can put on with roller. Postal brings free mounted samples. Ward Letter Co., 2549 Milwaukee Ave., Chicago.

SILVER Plated. Pure silver plating on metal; costs 3¢, sells 25¢. Instructions and secret formula for only 2 thin dimes, 2¢. Sterling Co., 231 Blvd., P., Denver, Colo.

AGENTS—You can easily earn \$20-\$30 a week selling our new household article. Repeat orders; sample, 35¢. Nagel-Gerth Co., 2833 Drake Ave., Chicago.

AGENTS—Coining money, newest article out; doubles life of auto tires. Send \$3 for \$5 outfit. Write today. Williams Specialty Co., Buffalo, N. Y.

AGENTS—Our patented specialties sell rapidly. Send for catalog and free sample. Baker Supply Co., 109 Marin St., Vallejo, Cal.

PATENTS Bring Wealth. Proof and advice free. Wedderburn, Patent Attorney, Washington, D. C.

SMALLEST Alarm Clock, 10¢ postpaid. W. H. Garner, 119 South Lafayette St., Evansville, Ind.

AGENTS—Everybody wears Hose. Sell direct consumer; the line that repeats. Credit plan helps you. Exclusive Agency to Hustlers. Address D 2 Lehr Mfg. Co., Denver, Colo.

WANTED Salesmen—Earn \$250 per month, sell dealers highly advertised article. Elasto Co., Station L, New York, N. Y.

440 PROFIT on each case. Best proposition on earth. Samples and particulars, 10¢. Mullin Co., 4410 Princeton Ave., Chicago, Ill.

MAKE your own rubber stamps. Complete outfit, \$10. Circular free. Stamp Works, Newcastle, Ind.

\$3 TO \$10 a day for reliable men and women agents; sample and complete outfit free; credit given; easiest, fastest, best sellers ever offered; a sale for every call. Alta of Moline, Ill., averaged near \$1 an hour; Wicht of St. Paul, Minn., working only part time, averaged \$135.00 month for six months; Still of Laredo, Texas, made \$12.50 in eight hours and says "anyone willing to work can make \$5 to \$10 a day." 400 per cent profits for you; full details free. Address Dow Sales Co., Dept. S, Topeka, Kan.

AGENTS on salary or commission. The greatest agent's seller ever produced; every user of pen and ink buys it on sight; 200 to 500 per cent profit; one agent's sales amounted to \$420 in six days; another \$32 in two hours. Monroe Mfg. Co. X, La Crosse, Wis.

AGENTS—Make \$2 each selling our wonderful luminous crucifixes; nothing to sell six a day; absolutely new; shine all night in darkest room. Pioneer Portrait Co., 1259 W. 63rd St., Chicago.

AGENTS—\$25 a week for 2 hours work a day. A brand new hosptiery proposition that beats them all. Write for terms and free sample if you mean business. Guaranteed Hosptiery Co., 1062 Third St., Dayton, O.

FREE—Safety Razor, Fountain Pen, other valuable premiums. Just a few hours spare time. Particulars free. Em-Co., 94, Duluth, Minn.

AGENTS—700 Things a Boy Can Make—Can you beat it? Set of 4 books that sell for only \$1. Everyone is interested. Enough to keep a boy busy until he grows up. Parents want them for their kids. Good liberal commission. Exclusive territory. Write to Popular Mechanics, Book Dept., 318 W. Washington St., Chicago.

AGENTS—\$15 to \$30 a week. The vest pocket cost and hat hook sells at sight. Easy work. Big profits. 10¢ brings sample and terms. Lynch Mfg. Co., 1824 Scott St., Wilmington, Del.

MY new Census Business Guide. Fastest selling book on earth. Agents making \$10 daily. Outfit free. Prof. Nichols, Dept. 6, Naperville, Ill.

IDEAL Mail Box. The best sanitary, suitable Mail Box manufactured. New Idea, patented. Valuable Premiums. Write for sample and Big Free Catalogue. Unlimited opportunity for agents. Sample Box, prepaid, \$1.25. Standard Sales Co., Rockingham, N. C. R. 2.

AGENTS—One cent invested in a postal card will bring you a \$35 to \$60 a week proposition. American Aluminum Company, Division 7, Lemont, Ill.

HUSTLING Agents Wanted for our fast selling Sanitary Household Brushes. Steady work. Big profits. Postal brings particulars. Dept. C. Hale & Kavanagh, New Britain, Conn.

SELL dry goods remnants. We can start you in new, profitable business. Remnant Store, Dept. 10, Cincinnati, O.

MAKE yourself independent by silvering mirrors. Send for booklet. M. K. Thompson Co., Dept. K, Akron, Ind.

AGENTS to represent manufacturer. Lotion, Waverly St., Buffalo, N. Y.

BOKARA Diamonds—Agents, everyone, to wear and sell our famous Bokara Diamonds. Write for sample offer and catalogue. Free, Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

AGENTS—Our new De Luxe Steel Mantle Burner, Fastest seller on market. fits all lamps. Converts kerosene into gas. Smokeless, odorless. Guaranteed perfect white light. Sample burner postpaid 25¢. Lyndhurst Burner Co., Dept. B, Lyndhurst, N. J.

EARN \$15 to \$25 a week or more as our Mail Order Dealer Right from your own home. Hold your position until entire time is required. We are manufacturers and owners of patented just-in-season specialties. If you are just starting a Mail Order Business or if already established, you can't afford not to handle our Patented Money-Making Getters. We sell exclusively to our Mail Order Dealers. We protect them. We carry stock and furnish everything. No canvassing. Small capital. Experience unnecessary. Write today for Latest Patented Leader and Manufacturer's Easy Selling Mail Order (copyrighted) plan backed up by "Whole Truth." Positive Proof and Sworn Statement. J. M. Pease Mfg. Co., 533 Pease Bldg., Michigan St., Buffalo, N. Y.

MR. Agent may we interest you in three of the best selling and most profitable articles ever offered. Would 400% profit make you "take notice"? For samples enclose 4¢ postage. United Sales Agency, Franklin, Pa.

150% PROFIT selling our sign letters. We'll show you how. 100 varieties; sample free. Johnston Co., Quincy, Ill.

AGENTS—Our Sun-Ray incandescent kerosene mantle burners guaranteed, best on market; 180 candlepower light. Galion kerosene lasts 60 hours. Particulars free. Simplex Gaslight Co., Dept. P, New York.

AGENTS are successful handling our automatic razor stropper—easy seller—satisfaction guaranteed. Retails \$1.50. Profit 100%. Write for terms. Auburn Supply Co., 7748 Peoria St., Chicago.

CASH for names, addresses, information, etc. Steady income at home. Instructive booklet for stamp. Information System, 272, Marietta, Ohio.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10¢ for a 25¢ sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Patsy Needle Co., 102 Union Sq., Somerville, Mass.

AGENTS—County and State; men and women everywhere to sell the Pinless Clothes Line; a practical labor saving invention, lasts life-time, sells on sight, gives perfect satisfaction. Agent Sutton of Georgia, sold over million feet; 100% profit; write quick for exclusive territory; information free; sample prepaid 25¢ stamp. Pinless Clothes Line Company, 520 Wilcox Bldg., Portland, Oregon.

AGENTS—We manufacture glass paper. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10¢. S. H. Parrish & Co., 282 S. Clark St., Chicago.

AGENTS are making \$50 a week selling Steel Mantle lamp and lantern burners. Sample burner mailed to your address for 25¢. Particulars free. Steel Mantle Light Co., 339 Huron St., Toledo, O.

YOU can make \$888 as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Reed St., Newark, N. Y.

AGENTS Wanted—Mechanics and shopmen make over \$100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 47 Bay St., Canton, O.

50% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metalite Letter Co., 406 N. Clark St., Chicago.

AGENTS Wanted—Sell Rich Looking Imported 36x68 rugs, \$1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profits, \$57. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Stonington, Maine.

SALESMEN wanted: A reliable, permanent business, selling Koeth's Kombination Kit, the most wonderful tool ever invented. Six pairs drop forged tool steel jaws, one pair handles makes pliers, pincers, punches, wrenches, etc. Invaluable for mechanic, farmer, chauffeur, handy man. Currier-Koeth Mfg. Co., 52 West Street, Coudersport, Pa.

AGENTS make \$30.00 weekly selling our 500 Handy Household Articles; catalogue free. Scheff Co., 1137 Wells St., Chicago.

AGENTS: Our Columbia Folding Hand Bag is the best proposition on the market. Not sold in stores. Big profit. Write for terms and other big sellers. S. V. Diamond, 35 West 21st St., N. Y. C.

MEDALLIONS sell at sight, 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Besag Co., 1205 W. Randolph St., Chicago.

WE manufacture six fascinating game boards, 100% profit. Orders repeat. Can be carried as side line where Candy, Pipes and Cigars are sold. Particulars free. Unique Novelty Co., Independence, Ind.

AGENTS—Unusual sellers. Big profit payers. Novelty jewelry, perfume, bosomy. Price list, particulars free. Block Bros., 477 Eighth Avenue, New York.

PERFECTION Pocket Adding Machine. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. B, Cincinnati, Ohio.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., G. W., Chicago.

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Yours, Desk C. R., Omaha, Neb.

400% PROFIT selling Gordon Photo Pictures. High grade work. Samples and catalogue free. Luther Gordon Co., Northwestern Bldg., Chicago.

I WILL start you earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Reimond, Dept. 396, Boston, Mass.

KEY tag—German silver—marked with your name and address, with key ring, 15 cents. We want you to take orders. 100% profit. We sell blank tags, steel letters, key rings, etc. Pease, Die Maker, Winchester, N. H.

AGENTS make enormous profit handling our quick-selling imported Oriental staples and novelties. Never been advertised. Re-orders. Exclusive territory. Write for particulars. Shaw Kanematz, Box 529, Portland, Oregon.

HELP WANTED

SONG Poems Wanted—Connect with Washington's Big Publishers. Best chances for success through our selling plan; complete introductory service through our field agents. Illustrated Book Free. Haworth Music Publishing Company, 4226, Washington, D. C.

WANTED—Men and women; for government positions. \$80 month. Annual vacations. Short hours. No "layoffs." Common education sufficient. Over 12,000 appointments coming. Influence unnecessary. Farmers eligible. Send postal immediately for free list of positions open. Franklin Institute, Dept. E 21, Rochester, New York.

YOUNG Man—Would you accept and wear a fine tailor-made suit just for showing it to your friends? Could you use \$5 a day for a little spare time? Perhaps we can give you a steady job; write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Co., Dept. 727, Chicago.

FREE Illustrated book tells about over 360,000 protected positions in U. S. service. More than 40,000 vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Easy to get. Just ask for booklet A 29. No obligation. Earl Hopkins, Washington, D. C.

U. S. GOVERNMENT wants Railway Mail Clerks—City Carriers—Postoffice Clerks. \$80 month. Short hours. Steady work. November examinations everywhere. Coaching free. Write immediately. Franklin Institute, Dept. E 21, Rochester, N. Y.

TRAVELING salesmen answer this. Best side line yet. Brand new. Pays full traveling expenses, \$4 per order. Two to four orders a day sure. Consigned goods. Pocket sample. Prompt commission. Dyer Mfg. Co., 2003 S. Michigan Ave., Chicago, Illinois.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and sample free. One Dip Pen Company, Dept. 2, Baltimore, Md.

REPRESENTATIVES Wanted. Your chance. Take it now. Easy work listing names and property. Send dime for particulars and contract. "National Exchange," Box 72, Waterloo, Iowa.

WANTED—Railway Mail Clerks—City Carriers. \$80 month. Examinations everywhere soon. Coaching free. Franklin Institute, Dept. E 21, Rochester, N. Y.

GO on the Stage. Vaudeville career offered you. Experience unnecessary. Managers endorse my method. Instructive Vaudeville book free. Write today. Fredric LaDelle, Sta. 10, Jackson, Mich.

BOILER Room Specialty. Leading manufacturer wants an exceptionally high grade salesman, capable of selling \$100 specialty to large power plants. Minimum com. on each sale, \$25. Ladd, 885 Niagara St., Buffalo, N. Y.

MAKE money writing short stories. Big pay. Free booklet tells how. United Press Syndicate, San Francisco.

GOVERNMENT Wants Help. Write for list of positions open. Franklin Institute, Dept. E 21, Rochester, N. Y.

ANY intelligent person may earn good income corresponding for newspapers. Experience unnecessary. Address Press Correspondence Bureau, Washington, D. C.

WANTED salesmen everywhere, to sell entirely new articles for the household, office and factory, 100 to 200% profit, ready sellers. Jackson Mfg. Co., Memphis, Tenn.

MEN and women wanted for government positions. \$80 month. Thousands of appointments coming. Write for list of positions open. Franklin Institute, Dept. E 21, Rochester, N. Y.

\$5 FOR Four Hours' Work—Proposition for chauffeurs or mechanics. H. Davis, 33 E. Main St., Columbus, Ohio.

YOU can make \$10 daily restoring colors to faded rugs and carpets in spare time; tremendous opportunity in your community; simple, easy; free particulars. Cox, Dept. MA, Omaha, Neb.

YOU are wanted for government job. \$80 month. Send postal for list of positions open. Franklin Institute, Dept. E 21, Rochester, N. Y.

SALESLADY wanted for Highgrade Corset, not sold in stores. Best corset, best proposition to salesladies. References. Wade Corset Co., Station L, New York.

SIDELINE, new advertising novelty. Sells in every town. Large commissions. Central Sales Co., Dept. A, Lincoln, Neb.

BE a Detective. Write Johnson's Detective Training Correspondence School, Houseman Bldg., Grand Rapids, Mich.

READ the Agents Magazine. 2 months 10c. Agents Magazine, Chicago.

WE teach you a trade in a few months' time; no expense but your work. Electricity, automobiles, plumbing, bricklaying, 100 satisfied workmen today; 40 jobs going. Catalog free. United Trade School Contracting Co., Los Angeles.

BIG Money Writing Songs. Hundreds of dollars have been made by writers of successful words or music. Past experience unnecessary. Send us your song poems, with or without music, or write for free particulars. Acceptance guaranteed. If available, by largest publishers in Washington—only place to secure copyright. H. Kirkus Dugdale Company, Dept. 263, Washington, D. C.

WE train detectives. You can be one. Splendid opportunities. Travel. Earn \$100 to \$300 monthly. This fascinating profession taught practically and scientifically by mail at a nominal cost. American School of Criminology, Dept. F, Detroit, Mich.

UNCLE Sam is a liberal employer. Qualify for a government position. We prepare you by mail for any Civil Service Examination. Write today for free booklet 32. Capital Civil Service School, Washington, District of Columbia.

WANTED—Young men to take subscriptions in their locality for a well known mechanical trade publication. Liberal inducements; a chance of permanent employment for capable men. Domestic Engineering Co., 445-447 Plymouth Court, Chicago.

7,000 GOVERNMENT jobs open. Write for list. Franklin Institute, Dept. E 21, Rochester, N. Y.

WANTED—Men and women to earn \$6 to \$15 per day. Send stamp for particulars. M. S. I. A., Indianapolis, Indiana.

PATENTS Bring Wealth, Proof and advice free. Wedderburn, Patent Attorney.

EARN \$10 to \$15 a week and hold your position besides. No canvassing. We, as manufacturers of patented just-in-season specialties, have new easy mail order plans to keep factories busy. We furnish everything. Large profits. Small capital. Experience unnecessary. If you are one of the want-to-go-ahead kind, write for our most modern (copyrighted) plans. Sworn statement. J. M. Pease Mfg. Co., 549 Pease Bldg., Michigan St., Buffalo, N. Y.

WANTED—Distributors of advertising matter everywhere. American Distributor, 100 Mount Pleasant, Pennsylvania.

WANTED one thousand chauffeurs and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$26.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1080 Michigan Ave., Chicago.

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Yours, Desk C. R., Omaha, Neb.

I WILL start you earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Reimond, Dept. 396, Boston, Mass.

BE an electrical meterman—\$900 to \$1,500 a year. New field. Demand for competent metemen greater than supply. Personal, practical mail instruction qualifies you for splendid position. Graduates assisted. Write for particulars. Fort Wayne Correspondence Schools, Dept. 20, Fort Wayne, Ind.

WANTED—Hustling man in each locality. Join this Society. Sick, accident, death benefits. Introduce our Memberships. Spare time to start. \$50 to \$300 a month. Write, Box JF-233, Covington, Ky.

WANTED, Agents, Machinists, Attention! Increase salary, new revised Saunders' Hand-Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth: \$1.25, \$1.50, leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

GOVERNMENT post office examinations everywhere soon. Get prepared by former U. S. Civil Service Examiner. Write today for free booklet. Patterson Civil Service School, Box 828, Rochester, N. Y.

MEN and boys to learn automobile repairing, driving on up-to-date cars; electricity, civil engineering, surveying. Methods most practical. Room and board while learning. Positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2110 W. 7th, Los Angeles.

CASH for information, names, formulas, and ideas. Steady, profitable home business. Instructive booklet for stamp. Information System, 273, Marietta, Ohio.

CEMENT

ADJUSTABLE Burial Vault Molds, new and simple. Makes the best vault known and offers big profits for right man. Write for booklet, A. S. V. Co., Peru, Ind.

IF you want the best information on cement and concrete construction, subscribe for Concrete-Cement Age, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.50. Concrete-Cement Age, 135 Newberry Bldg., Detroit, Mich.

CONCRETE Building Block Machines and moulds. Free catalogue. 5 Market St., St. Louis, Mo.

MOTION PICTURES

MOVING Picture Films and Equipment of all kinds appertaining to the business. For sale over one million feet of film listed in our new catalogue. Acme Film Co., 128 West 37th Street, New York.

MOTION picture plays wanted. You can write them. We teach you by mail. No experience needed. Big demand and good pay. Details free. Ass'd M. P. Schools, 601 Sheridan Rd., Chicago.

POWEITS No. 5 Moving Picture Machine, \$100, or will exchange best offer. Martin Fredericks, 2917 North Twelfth Street, Philadelphia, Pa.

WANTED—Picture Play Writers. Big pay. We'll teach you how. United Picture Play Association, San Francisco.

BUY the Junior guaranteed Professional Moving Picture Film making outfit for special events. Eberhard Schneider, 219 Second Ave., New York.

FOR Sale—Slightly used Moving Picture Machines. One Edison machine, \$65. Chas. Telgarden, Greenville, O.

MACHINERY, TOOLS, SUPPLIES

REWARD—We wish to purchase some good Second Hand Machinery for Iron and Brass working and will pay a Cash Reward for first information as to where same can be found provided we purchase. Chicago Machine Tool Company, 125 North Canal Street, Chicago, Illinois.

FOR Sale—Two American Saw-Mill Machinery Co., 6 inch water turbines, one with and one without cast iron casings. Address F. E. L., 5540 Woodlawn Ave., Chicago, Ill.

FOR Quirk Sale 11 inch engine lathe, \$60; 12", \$80; 13" Mechanics drill, \$27.50; planer, engine, fox, bench lathes, arch, horn, apron, punch and kick presses, power sq. shear, grinders, tire bender, etc. Fred. C. Dickow, 35 So. Desplaines, Chicago.

NEW Vertical Boilers, 1½ hp. complete, \$37. Send for sixty-four page Catalog of Machinery bargains: Boilers, engines, electrical machinery, machine tools, etc. Wickes Brothers, Saginaw, Mich.

MANUFACTURING concern reducing equipment of Chas. E. Wright Metal Band Saw Machines, desires to dispose of 25 machines all in A-1 condition. Any reasonable offer accepted. Address Machinery, 816 Broad St., Newark, N. J.

FOR Sale—Upright Boiler, 8 hp., splendid condition, completely equipped, cost \$250, will take \$125. Photograph. Benedict, 1009 Davis St., Evanston, Ill.

FOR Sale—6x6 single, Climax Power Air Compressor. Cost new, \$250. Fine condition, \$100 immediate sale. Empire Type Foundry, 1058 Ellicott Sq., Buffalo, N. Y.

MANITOU Marine Motors, 5 hp., \$62; 10 hp., \$104; 20 hp., \$180. Satisfaction guaranteed. Rough and Machined castings of same for sale. Richards Engine Works, Manitowoc, Wis.

FOR Sale—2 hp. motor, 4 ceiling fans; direct current. Will exchange for alternating. E. K. Balligh, Prairie City, Ia.

HOW to run and install gasoline engine; booklet and Digest one year, 25c. Has gasoline engine department, Digest, Grand Rapids, Mich.

GASOLINE Engines: New 4 cylinder, 45 hp., New 35 hp., New 22 hp. Cheap. Guaranteed. Boat or automobile. Bill Ferguson, Waterloo, Iowa.

½ H. P. GASOLINE engine castings, \$5. Complete engine \$22.50. Stamp for circular. Crown Motor Works, Elgin, Ill.

FOR Sale—Small electric motors; bargain; write for information. Henry Gossman, Turtle Creek, Pa.

22 H. P. Vanduzen Gasoline Engine, \$400. What have you to trade? Frank Suffern, Decatur, Ill.

ONE lathe 16" swing, 8" bed. Cheap. Minn. Eng. & Mach. Co., 2399 University St., St. Paul, Minn.

FOR SALE—20 hp., 4-cyl. marine engine. Good condition. \$150. E. Larson, Blew Lake, Wis.

FOR Sale—One 30 K. W. engine and dynamo, 125 volt; one two side planer, 26 in. Geo. J. Adams, 39 South St., New York.

FOR Sale—One six horsepower vertical Alamo gasoline engine; never used. W. B. Connally, Trenton, Ga.

CASTINGS, ½ horsepower, water cooled, two cycle, with drawings, \$4. ½ horsepower, \$6. Muskin Mfg. Co., Newport, Kentucky.

FOR sale or exchange. 10 Horse Stanley engine and boiler. W. J. Morgan, 4528 Kennerly Ave., St. Louis.

\$20 TAKES 2 hp. dynamo or motor. Hall, 632 W. 62nd St., Chicago.

7 H. P. Portable Olds Engine, running order. Bargain at \$25. Ralph Cowles, Canton, Conn.

6 H. P. Watkins, 2 cylinder for \$100. Evan Owen, Weems, Va.

GASOLINE Engines, new way, almost new—7 Horse, \$100; 2½ Horse Ideal, \$40. Concrete mixers, hoists, block and brick machines; trucks, scales. Standard Scale Co., 1345 Wabash Ave., Chicago.

PULLEYS, Gears, Sprockets, Shafting, Hangers; see page 144. W. A. Jones Foundry & Machine Co., Chicago.

PATENTS Bring Wealth. Proof and advice free. Wedderburn, Patent Attorney, Washington, D. C.

FOR Sale—45 hp. Atlas engine; 66 Enterprise meat chopper; silent cutter, jacket kettle, rendering outfit, 3,000 lbs., norm. geared elevator 50 ft., 15 in. leather belt; all good as new. D. Hersey, Harvard, Illinois.

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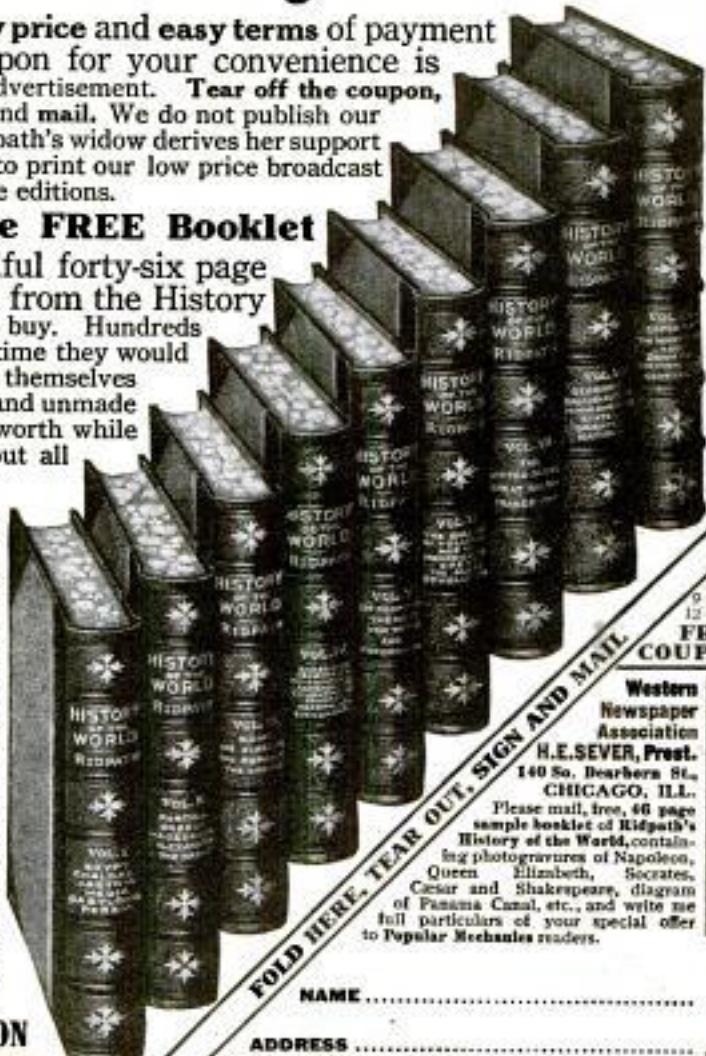
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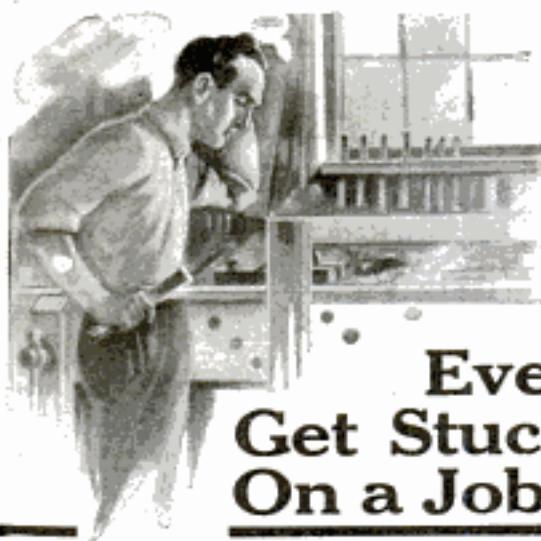


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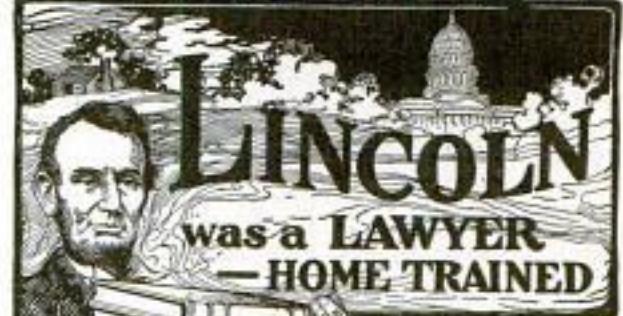
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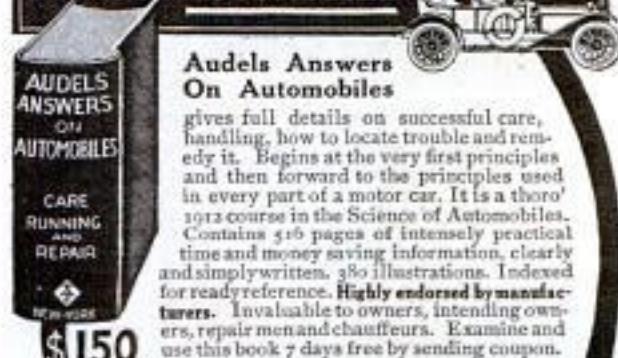


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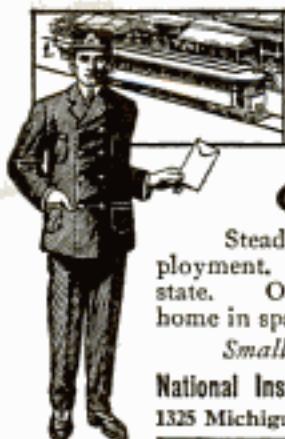
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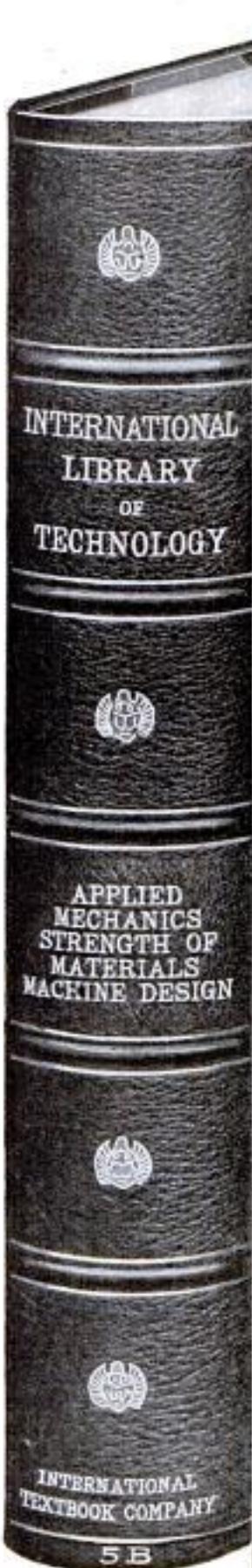
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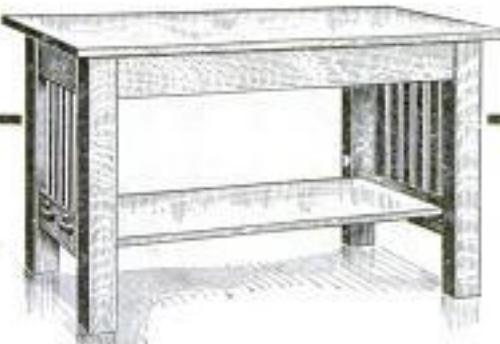


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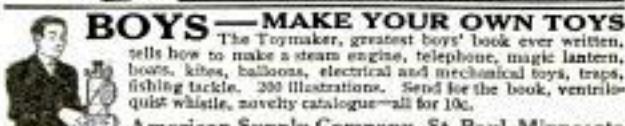


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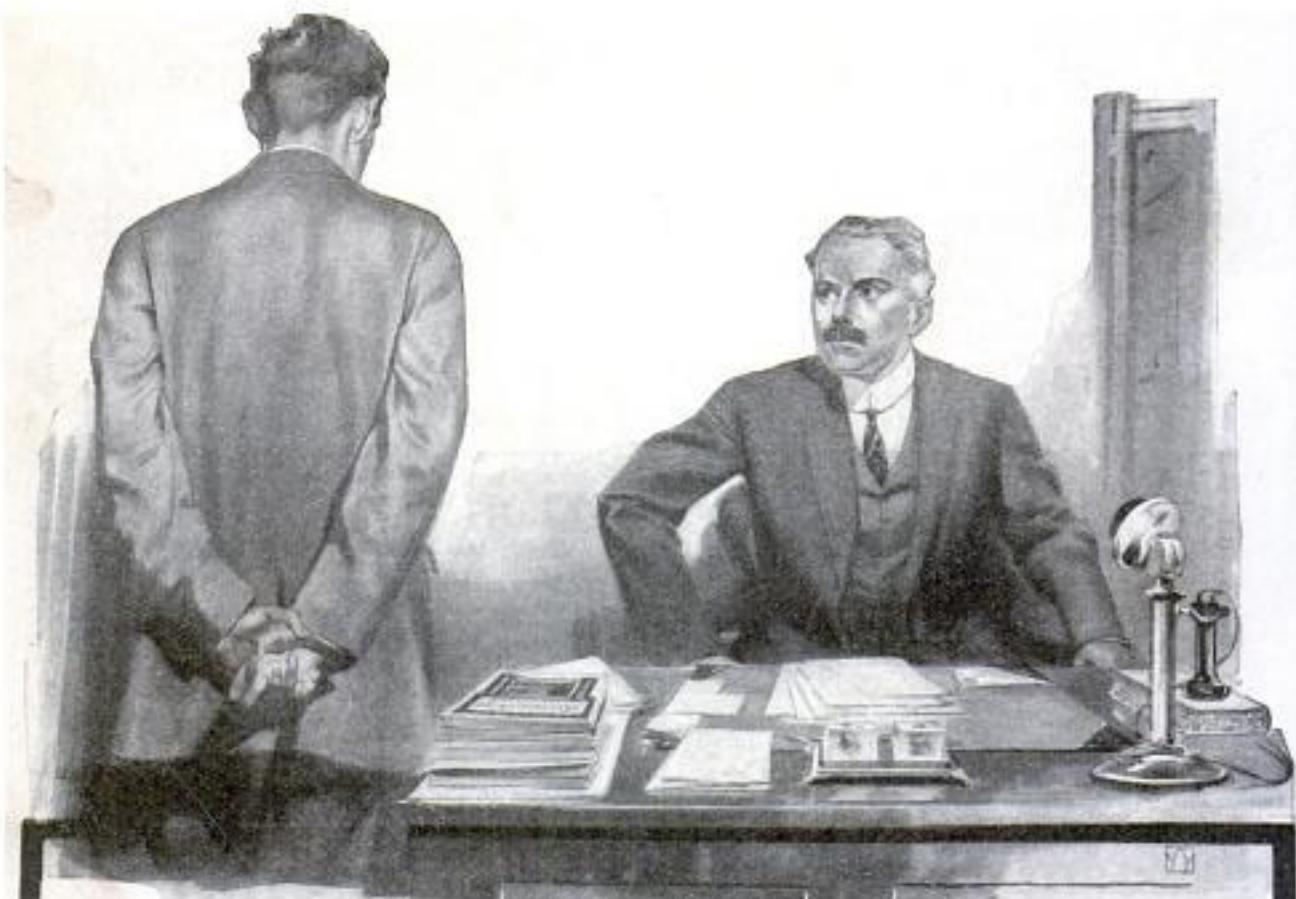
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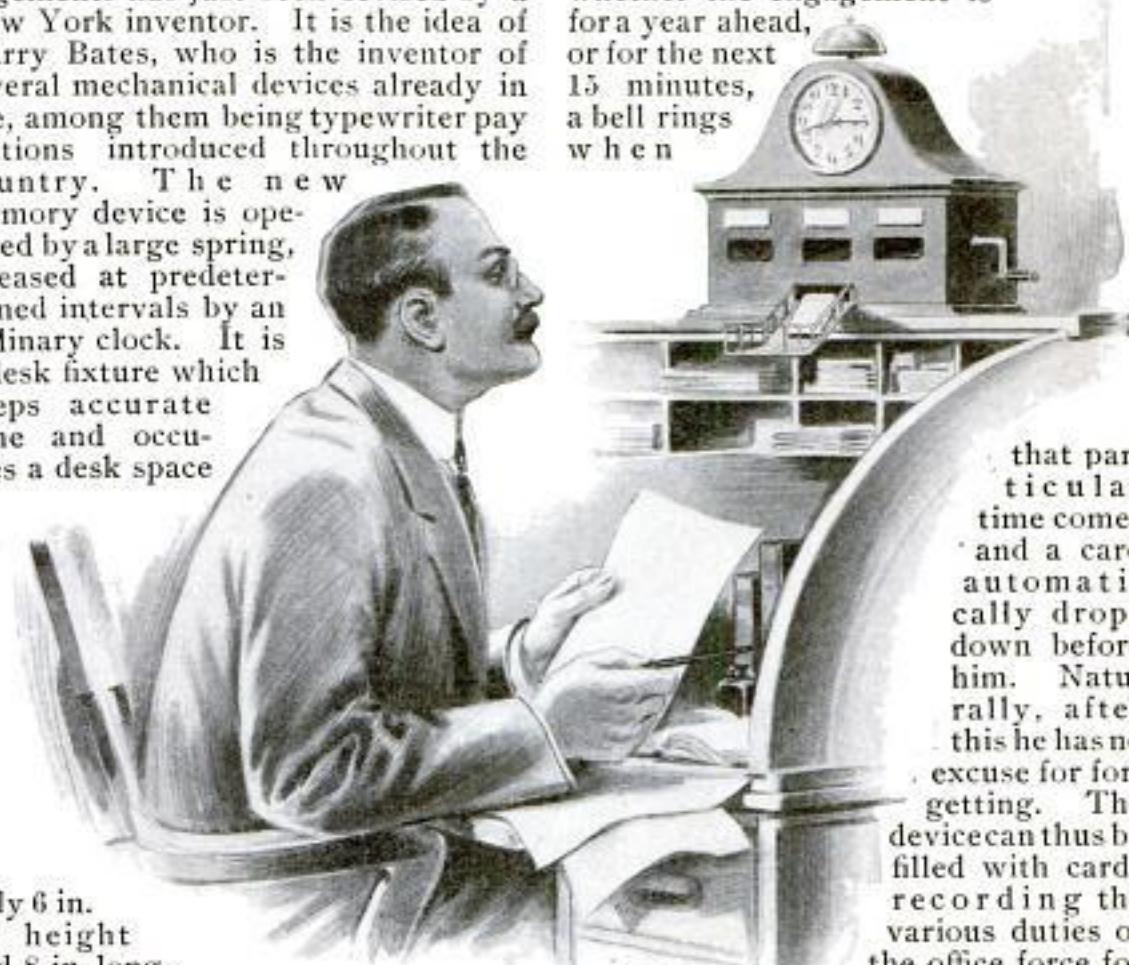
SEPTEMBER, 1912

No. 3

Memory Machine That Stays on the Job

THE first mechanical apparatus intended to prevent the busy man from forgetting any of his engagements has just been devised by a New York inventor. It is the idea of Harry Bates, who is the inventor of several mechanical devices already in use, among them being typewriter pay stations introduced throughout the country. The new memory device is operated by a large spring, released at predetermined intervals by an ordinary clock. It is a desk fixture which keeps accurate time and occupies a desk space

andum of it on a card and drops it into the case in the pigeon hole set aside for that purpose. No matter whether the engagement is for a year ahead, or for the next 15 minutes, a bell rings when



only 6 in. in height and 8 in. long.

It has the appearance of a desk clock with three sets of pigeon holes, one series for the months of the year, another for the days of the month, and the third for each quarter of an hour of the day.

A busy professional, or business man wishing to be reminded of something he is to do in the future, makes a memor-

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that particular time comes and a card automatically drops down before him. Naturally, after this he has no excuse for forgetting. The device can thus be filled with cards recording the various duties of the office force for

the next day, and in the absence of the head of the office each clerk will be reminded at the proper time of just what he has to do. No alarm ever comes from the case unless there is a memorandum in it, and it can be operated by one

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inine Paris has the rage. The umbrella heads represent different birds smiling a stupid smile which is guaranteed to make one laugh, even though depressed. The bird heads are designed by various well-known French caricaturists and bear their autographs, which makes them interesting objects for examination and comparison.

BREATHING OZONIZED AIR INCREASES WEIGHT

Recent tests made upon men employed in the First National Bank of Chicago have shown that ozonizing the air increases the weight of clerks who breathe the mixture, by promoting deep and exhaustive breathing.

The men upon whom the experiment was tried were at work in the bank's vault, a place the ventilation of which has always been a difficult problem. The ozone was produced in the room by means of several electrical machines placed in the corners.

The weight and chest measurement of each man employed in the vault were taken when the ozonizers were installed, and again after the machines had been in operation for two months. It was found that in this short space of time, every man had gained in weight as well as in chest measurement. And the benefit was not confined to the physical side of the man; the mental faculties as well were quickened by the inhalation of the pure fresh air. The men themselves were enthusiastic about the success of the new system.

The process is familiar. The ozone, which is simply a special form of free oxygen, is produced in the atmosphere by the silent discharge of electricity.

ELECTRICAL ACCIDENTS SHOW NO INCREASE

Reports of factory inspectors in London have brought out some remarkable figures on the increased use of electricity as power. During the last 10 years, the report shows, the use of electric power from the public plants alone has increased from 30,000 hp. to 74,000 hp. This in itself is not so astonishing as the fact that since 1907 the total number of accidents annually has not increased at all. In the opinion of the inspectors such accidents as did occur were not so much due to the ignorance, or incompetence, of em-

ployes handling electrical machinery as to the carelessness of employers in failing to provide proper safeguards for its use. As an example, it is pointed out that the sparking of electrical apparatus in a dusty oil-cake mill was responsible for an explosion and consequent loss of life, but might have been avoided if precautions had been taken to prevent the sparking.

ELECTRIC MILKING IN THE PASTURE

Milking the cows in the pastures by means of electrical milking machines is being successfully tried on the great farm near Berlin which is operated by that city. Cables carrying power are laid out to the pastures and the motor and milking apparatus all in one machine is easily carried around. It has been found that one man can take care

of the operation of six milking machines out in the fields. Electricity is used in every possible way on the farm,



and for this purpose a network of transmission wires covers the farm, so that short flexible cables for motors will bring power to any desired spot from the feed wires.

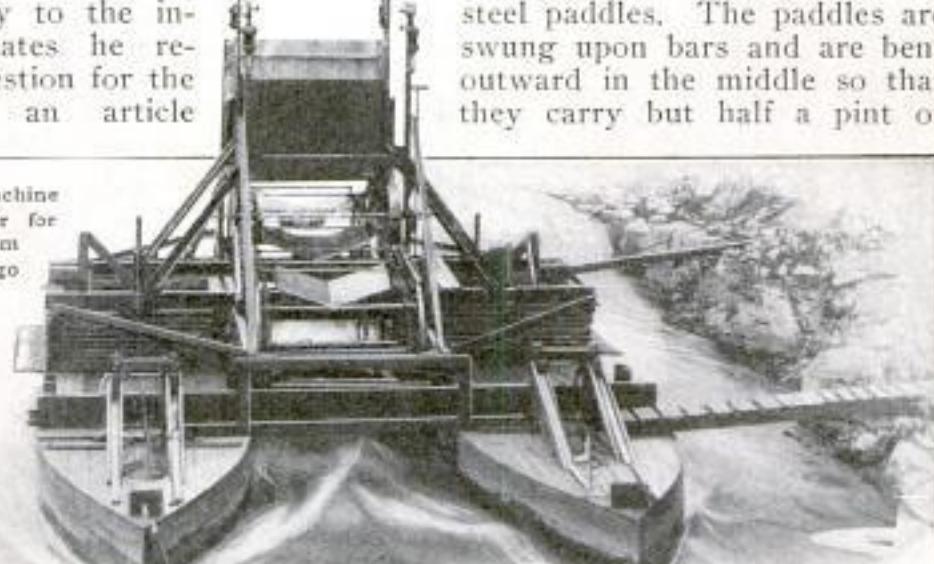
MOTOR GETS POWER FROM STREAM FLOW

A hydroelectric power machine, which the inventor claims will be an important factor in the manufacture of electricity by water power, has just been tested in the Chicago Drainage Canal at Joliet, Ill., with results satisfactory to the inventor. He states he received the suggestion for the machine from an article

which appeared in Popular Mechanics Magazine a year ago.

The machine consists of two cog-wheels, one 20 ft. and the other 12 ft. in diameter, over which run two chains 50 ft. long, equipped with 12 steel paddles. The paddles are swung upon bars and are bent outward in the middle so that they carry but half a pint of

Hydroelectric Machine Developing Power for Lights, from Stream Current in Chicago Drainage Canal



water after leaving the stream. A frame fits over the wheels and chain, and above it is placed an electric motor connected, by means of a chain, with a flywheel, which in turn is connected with the smaller of the two water wheels. The entire frame rests upon two barges and is lowered into the water so that the smaller wheel, which faces the stream, is almost submerged. At the initial try-out the machine showed 48 per cent efficiency in an eight-mile current, according to the inventor.

The motor was connected with a dynamo and electric current generated. Ten arc lights, a number of incandescent lamps and two searchlights were wired up to the generator and light was furnished for an evening band concert in the city park of Joliet.

"HURDLING" WITH A MOTORCYCLE

The very interesting illustration accompanying this article shows the so-called hurdle test for spring forks, which is carried out at the factory of one of the well-known motorcycle concerns in this country. The test consists in driving the cycle around an oval test track at a speed of about 40 miles an hour, across which a 4 by 4-in. timber obstruction has been laid. On striking this, the machine with its rider jumps about 2 ft. into the air and alights some 10 ft. away, thus subjecting the forks to a greater shock than they are ordinarily liable to suffer in regular service.

Testing the Strength of the Front Fork of a Motorcycle by Running at High Speed against an Obstruction



MAKING OVEREXPOSURE IMPOSSIBLE

Photographic plates in the use of which overexposure is impossible, have recently been put on the market by an English manufacturer. The improvement is due to the addition of certain chemicals (hydrazine and hydroxylamine derivatives) to the sensitive film. The speed of the plate is not adversely affected by the new method. In landscape photographs it is possible to include the sun itself without danger of "fogging." If, however, the exposure has been more than 40 times the normal, a special developer is required, the formula for which has been provided by the manufacturer. In all cases of shorter exposure the ordinary developer is found satisfactory. With the new plate it is possible to photograph a room with a brightly lighted window, notwithstanding its acute contrast with the interior. In instances of this character, of course, it is necessary to prolong exposure in order to obtain detail in dimly lighted portions of the picture.

Another development in photography is the production, also by an English manufacturer, of a print paper which is termed cream-canvas bromide and gaslight paper. As indicated by the name the paper is of cream color over which is spread the canvas grain which gives the finished print the appearance of a one-color painting. The tone of the paper is suited to effects obtained by sunlight, and for figure studies in strongly lighted studios.

Three Photographs of the Same Test, Fitted Together

GRADING A RAILROAD THROUGH ANT HILLS

Ant hills are furnishing a considerable portion of the work for contractors on the present extension of the

the ant hills which are encountered, but as all the earthwork is done by hand labor, much time is spent tearing



Cape-to-Cairo road in Africa, which is now proceeding from Elizabethville in the Congo to Bunikeia, for this stretch of several hundred miles is over a plain varied only by the enormous ant hills which in some instances rise 60 ft. high.

Observatories intended primarily for surveying purposes have been built by the contractors on these ant hills. The preparation of the roadbed

through this section requires only the cleaning out of the jungle along the right of way, and the destruction of



Upper View—Laborers Tearing Down a Great Ant Hill on Level Plain in Congo to Make Way for Cape-to-Cairo Railway Roadbed

Lower View—Monster Ant Hill on the Cape-to-Cairo Railroad near Elizabethville, Congo, Which is being Used by Surveyors as an Observatory

down the ant hills. The ants are white, and well under an inch in length. They are very destructive, ruining almost anything they encounter except metal, and frequently they travel in armies which do great damage. They destroy only the parts of an article which are not exposed to the open air, so that the surveyors have found that when they left shoes where the ants could reach

them, the soles were entirely eaten away by the insects while the uppers were left.

VAST SECTION COVERED WITH ASHES FROM

A mighty volcanic eruption which covered a vast section with volcanic ashes, all on United States territory, this summer, passed almost unnoticed due to the fact that it occurred in the sparsely settled southwestern Alaska. News comes out of that region so slowly and so incomplete that facts of the extent of the eruption, its damage, and photographs of its progress are difficult to obtain. Yet its magnitude is indicated by the fact that the clouds of volcanic ashes were observed as far away as Prince Rupert, British Columbia, a thousand miles from the scene of the disturbance in the Aleutian Range.

Mt. Katmai and Mt. Peulik of this range were both charged with the eruption, Peulik being the first considered as there is little knowledge about the mysterious Katmai, far in the mountain wilderness, but the later evidence all points to Katmai being the disturber, located not far from the sea-shore settlement of Katmai, a short distance north of Mt. Peulik and Cold Bay. Reports based on unsatisfactory and distant views of Mt. Katmai are to the effect that the mountain now has three craters.

On June 6 the mighty cannonading of Katmai "blowing off its head" was heard over a great section of southwestern Alaska, and by night the rain of volcanic ashes came. The nearest village of any size is Kadiak, on Ka-

diak island, which has a population of about 500, most of the people living on the fish-canning industry. For three days following the outbreak of Katmai, gray volcanic ashes filled the air so that one could not see more than five feet. The entire population was taken on board the revenue cutter "Manning" and taken out to sea to escape suffocation.

The ashes covered Kadiak to a depth of from one to four feet, and appeared to be in three layers, powdered pumice stone at the bottom, yellow sulphuric ash, and then the gray volcanic ash on



Lower View Shows Volcanic Ashes One to Four Feet in Depth over Kadiak Village



ERUPTION OF ALASKAN VOLCANO KATMAI



Katmai in Eruption

Reindeer Seeking Shelter



Near View of Katmai

top, constituting the larger portion of the coat. The roof of one of the canneries gave way under the weight. As far away as Cook Inlet, 400 miles to the northeast, the ashes in some places accumulated to a depth of a foot.

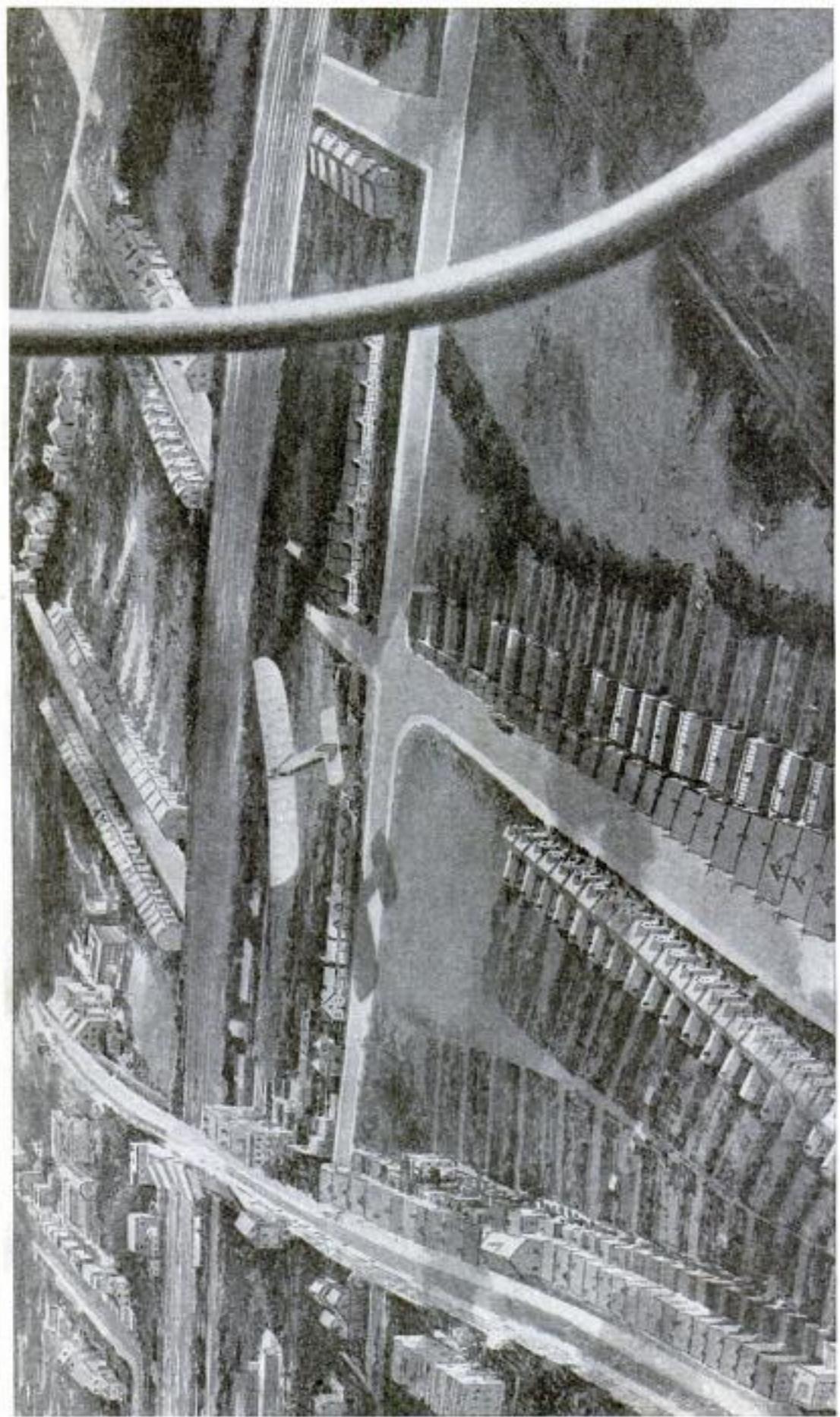
Inhabitants of Katmai village fled by boat, at the beginning of the eruption to the island of Afognak across Shelikof Strait, and from the settlements of Cold Bay, Kanatuck, Douglas, Kanganute and Savanoosky the frightened fishermen and ranchers hurried

in boats to Kadiak and out on the open straits. A mother and her child are known to have lost their lives in Katmai village.

Photographs of the distant mountain in eruption were obtained from the deck of the steamer "Dora," between Kadiak and Afognak islands, on June 6, until, by 4:30 in the afternoon, daylight was blotted out and electric lights had to be used, in a season when daylight is almost continuous.

After the heavy rain of ashes came rainstorms, which were in the end providential to the inhabitants. The rain appeared to bring down some element which burned the skin, and blackened brass work on steamers, the explanation accepted on shipboard being that the element was of a sulphurous nature. However, the rain rapidly washed the ashes away in the thinner places, making it possible to resume agricultural operations. Stock had to be fed on baled hay for a few days, and then grass began to push up in places with great luxuriance. The rich volcanic soil of Kadiak and the adjoining shores will be improved measurably by the volcanic ashes, in the opinion of the inhabitants of the section, after rains have completed the work of beating this fine ash into the soil.

Smoke-abatement laws have been rigorously enforced in the Bengal province of India for the past 7 years.



ONE AEROPLANE IN FLIGHT PHOTOGRAPHED FROM ANOTHER AEROPLANE FLYING HIGHER IN THE AIR
In a recent aeroplane meet near London many striking views were taken from competing machines, this one being taken by a passenger in M. Verrier's biplane, flying at a height of about 2,000 ft., over Ealing, a suburban residence section. The monoplane pictured was at a height of about 400 ft.

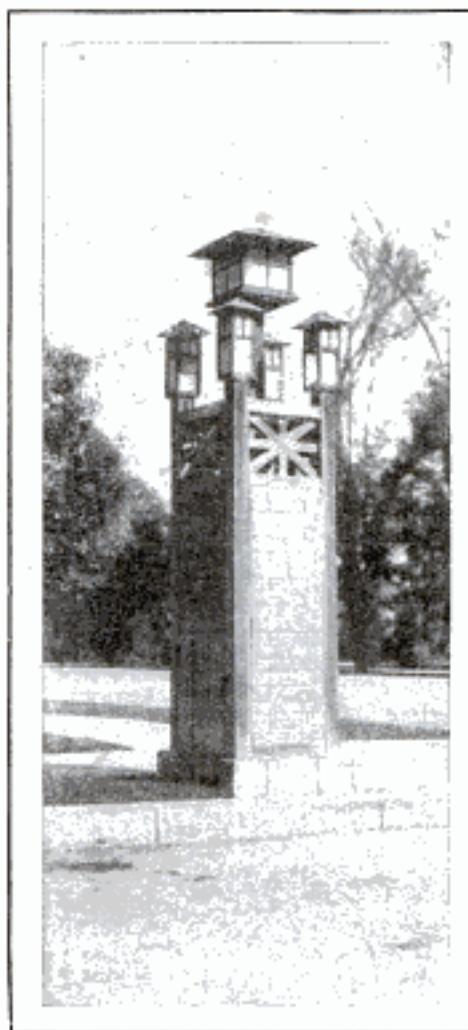
MISSION LAMP STANDARDS FOR STREET LIGHTING

The residents of a small and exclusive residential tract in Los Angeles have set up especially designed mission lamp standards at the corners in place of the ordinary cast-iron lamp posts commonly used. These standards do much to beautify the neighborhood.

Five rectangular lanterns of bronze and glass inclose the electric bulbs, and these are supported by a framework of unpainted timbers, which surround a substantial standard of dull red bricks, the whole resting upon a concrete foundation above the curb.

LOCOMOTIVES AT EACH END OF TRAINS

In changing from steam power to electric power for its enormous city and suburban passenger traffic, the Berlin Stadtbahn has decided to use electric locomotives, one at each end of all long trains, instead of having each coach fitted with motors to run separately. It is said 557 locomotives will be used with 690 passenger coaches and 29 repair cars. When two or more locomotives are coupled to the same train, as circumstances demand, these will be operated by one man by means of a simplified multiple-unit system. The assertion is made that experience gained with electric locomotives in Germany shows that maintenance costs are below those of motor coaches. The locomotive has large hauling powers and



Artistic Mission Lamp Standards Used for Street Illumination in a Residence District of Los Angeles

one such engine can therefore take the place of many motor coaches. Added to this, the motors and other electrical gear are very accessible, which is an important item from the point of cleaning and repairs. It also appears that since the motors of electric locomotives are spring-borne and placed high up in the body, there is less noise and vibration, as compared with motor coaches, and that they do less damage to the track. During the busiest hours of the day, when the traffic is heaviest, the trains will be made up of 13 six-wheel coaches, which will be propelled by two locomotives, one at each end of the train. At other times, when the railway is less busy, the trains will consist of five or eight cars, which will be coupled to a single locomotive. Trains made up in this manner can be driven from either end by fitting the last coach with a controller.

VIBRATIONLESS CONCRETE TABLES

Concrete tables to give absolute freedom from vibration have been constructed for the Butte School of Mines, as standards for laboratory balances. The concrete pillar is built up from the solid earth through the floor, to the required table height, and the balances are placed on the top of the pillar. For convenience in operating the balances, a wooden table is built up from the floor around the pillar, but kept entirely free of the pillar on all sides, lest vibration be communicated.

LABOR-SAVING DEVICES IN AN INVENTOR'S KITCHEN

A Los Angeles inventor has busied himself lately with the problems of the housewife, endeavoring to plan con-



The Folding Kitchen Sink in Place for Dishwashing

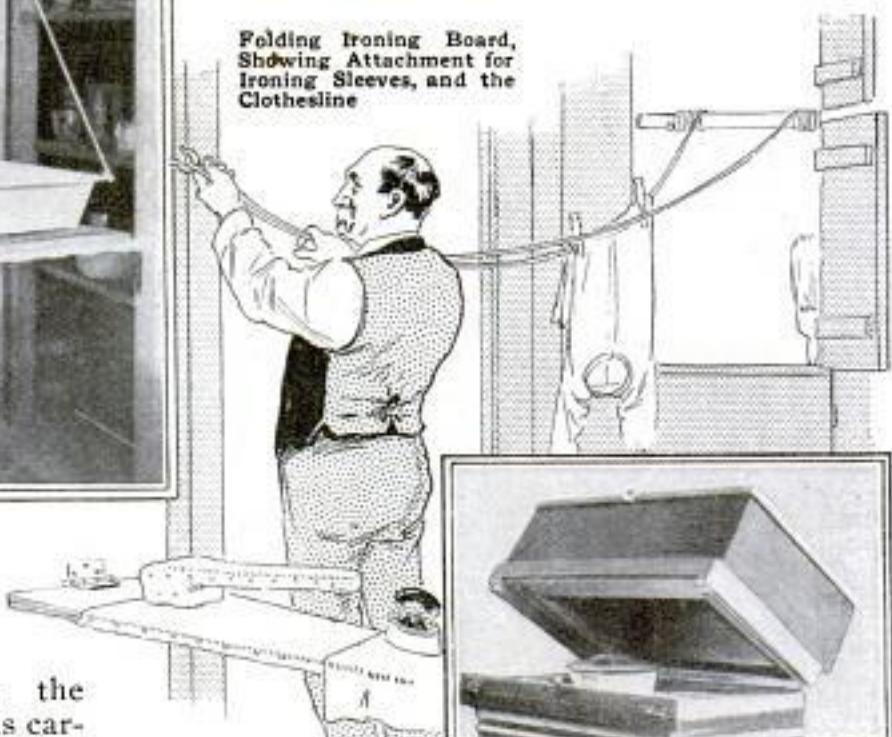
veniences which will make the lot of the worker in the kitchen easier. He has carried out the ideas in his own home and the result, although not perfect, contains in a rough-and-ready fashion ideas which may be developed into really practical labor and space-saving devices.

Included in these ideas is a disappearing sink, the combination of a fireless cooker with a gas stove, and a folding ironing board having an attachment for ironing sleeves. The sink folds back against the wall when not in use and is concealed by a door. When dish-washing time arrives, the door is opened downward and becomes a support for the sink, which is at a height enabling the housewife to be seated while at work. The hot and

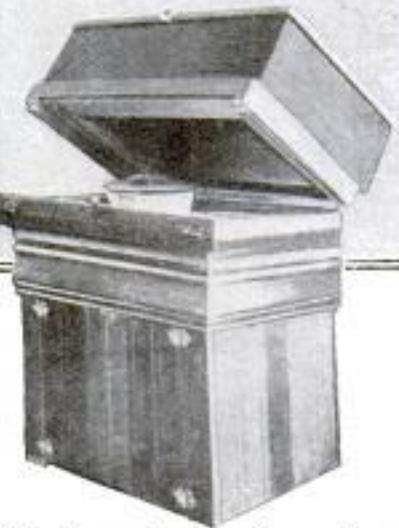
cold-water faucets are in the wall over one end of the sink.

In the combined gas stove and fireless cooker the gas plate is boxed in a wooden case, lined with mineral wool and provided with an inner casing of zinc. When the hinged lid is thrown back, the device serves as an ordinary gas stove. Food which requires hours of cooking is brought to the proper temperature and then the cover is dropped into place, the gas being allowed to burn a minute or two longer

Folding Ironing Board, Showing Attachment for Ironing Sleeves, and the Clothesline



The Combined Gas Stove and Fireless Cooker Which may be Operated as Either



to thoroughly heat the interior. A special intake and outlet for air is provided for the brief time during which the gas burns while the cover is down.

The ironing board folds back against the wall when not in use. In connection with it is a double clothesline on a spring reel. In use the loop end of the line is slipped over a hook at the farther side of the kitchen.

EYE INJURIES TO ECLIPSE OBSERVERS

Eye afflictions, resulting from looking at the sun during a recent eclipse visible in Germany, were common in Berlin following close after the event. On the day of the eclipse the sky was clear and the maximum obscuration took place at the noon hour when thousands were on the streets. Some persons used smoked glass while others, ignoring newspaper warnings, viewed the sun through a hole pierced in pasteboard. Not a few gazed at the mighty orb without any protection and these suffered most. Many cases of injury done to the eyes were reported by oculists and physicians, one surgeon reporting 14 cases.

Besides ordinary cases of inflammation, instances of more serious visual disturbances were noted, many fearing at first that they were becoming totally blind. Some patients admitted they had stared a full minute at the sun while others declared they had looked at "Old Sol" not more than a few seconds. Fortunately most cases made a relatively quick recovery, but it is predicted that the next eclipse of the sun visible in the German capital will be viewed with extreme caution.

PICTURE-SHOW ELECTRIC PLANT IN AUTOMOBILE

A motion-picture showman, who travels from place to place, giving shows in a tent, has equipped his automobile with an electric plant for the operation of the motion-picture machine and for the 45 electric lamps in and around the tent and on the automobile itself. The electric plant consists of a 60-volt slow-speed dynamo

which runs at 100 revolutions per minute.

The owner of the outfit and his wife travel from town to town in the automobile, which has covered over 14,500 miles, and the tent, seats and other

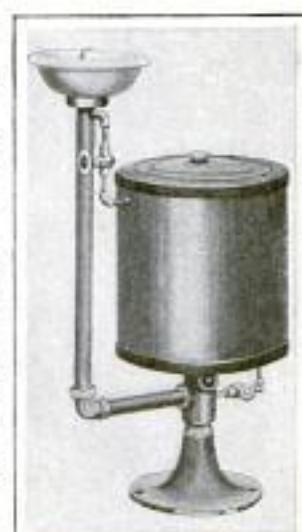


The Automobile Electric Plant Which Furnishes Current for a Traveling Motion-Picture Show

heavy equipment of the show are shipped by rail.

ICE-COOLED DRINKING FOUNTAIN

A bubbling drinking fountain with an arrangement for cooling the water by ice in a cooling tank is shown in the accompanying illustration. The cooling tank, which has a thick, cork-packed jacket, is equipped with a coil of brass pipe, and through this coil passes the supply of fresh water. The apparatus has a 1 1/2-in. pipe standard and the waste bowl is of cast iron with vitrified porcelain enamel on the inside. The water supply is controlled by a self-closing



bibb and the water is furnished through a bubbler which regulates within itself the height of the flow of water. After adjustment, the height of the water remains essentially constant and is regulated so as to prevent contact between the mouth and the appliance.

RIVALRY OF MOTORMEN TO SAVE POWER

To reduce the cost of electrical energy and at the same time make the number of fares run as high as possible, the manager of an English street-railway system put into effect with good results a bonus system for the motormen and conductors. The saving in electrical energy is reported to have been 25 per cent.

The system was worked out on the basis of a 12-weeks' run, and first, second and third prizes in cash were offered for the best showing by motormen of each route at the end of that time. Consolation prizes were offered to motormen who made a showing below the car-mile average of the 12-week period. Meters were used to record the operation of each car. In order to make the test as fair as possible, each motorman was allowed to handle the same car throughout the period.

When this portion of the scheme was first put into effect, such keen rivalry developed among the men that they rushed by corners and failed to pick up passengers

with the result that the savings made on electrical energy were lost in the passenger receipts.

The manager, however, had wit enough to put an end to this. He offered similar prizes to conductors turning in the most cash during the 12 weeks, over and above the average daily receipts on their routes. The result was the crew of each car came to an understanding. They agreed that they would both try to win prizes and split the money equally between them at the end of the period. The outcome of the double scheme was fine team work, more cash receipts, and the saving of "juice."

FIRE OR PANIC MENACE TO SKYSCRAPERS

Fire drills in every high building are urged by city building inspectors and others who have given thought to the dangers confronting the thousands hived in 20 and 30-story skyscrapers. The chief inspector of buildings for the Borough of Manhattan recently prophesied a disaster that will stagger humanity unless needed precautions are soon taken. So far as the construction of these buildings is concerned they are stated to be absolutely safe, but the disaster which is foretold is to come through fire or panic. It is pointed out that the proximity of stairways in many buildings to elevator shafts is one serious source of danger as, in case of fire, the shafts are likely to become



Suppressing the Revolt
against the French in
Morocco—A Chain of Prisoners
being Taken to the Court Martial

roaring chimneys. Other stairways and fire escapes are so constructed that a panic would almost certainly arise if they were used except where there is general knowledge of what to do in such an emergency. The feeling is rapidly growing that fire drills of some sort should be made compulsory by law in every high building, no matter how it may be occupied.

INTERNATIONAL WIRELESS REGULATIONS

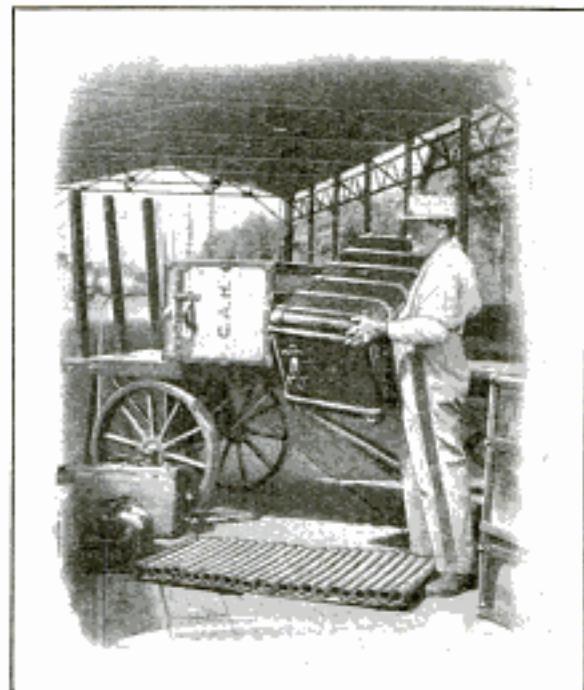
An echo of the "Titanic" disaster is found in the resolutions passed at the recent International Radio Telegraph Conference held in London. It was decreed that the wireless station of a ship at sea should remain silent for a certain period of each hour, during which the operator should be watching for distress signals only. In such cases the distressed ship should control the field within her radius, and should it happen that a number of boats answer her distress call she shall determine, in order to avoid confusion, which of those responding is to remain silent. With respect to weather observations, it was decided these should be given right of way over commercial dispatches. Representatives of the United States, Great Britain, Russia, Germany, France, Italy, Spain and Portugal signed the resolutions.

PUTS AN END TO BAGGAGE SMASHING

Baggage smashing will soon become one of the lost arts if the simple and effective device shown in the accompanying illustration is put into general use. The cushion, or mat, upon which the trunk descends in unloading, recently was adopted by the Cumberland Valley Railroad and that company reports that it has proved very efficacious. The photograph shows it in use at one of their stations.

The cushion is composed of four strips of hard wood to which are

nailed 24 pieces of scrap air-brake hose. The hose lengths are held in place by



Cushion Baggage Protector Made of Wood and Scrap Hose

1½-in. clout nails, driven through the strips of wood and clinched to the hose by means of an iron rod inserted while the nails are being driven. The cushions are 22¼ in. wide by 4 ft. 4 in. long.

DYNAMITE IN BRIDGE CONSTRUCTION

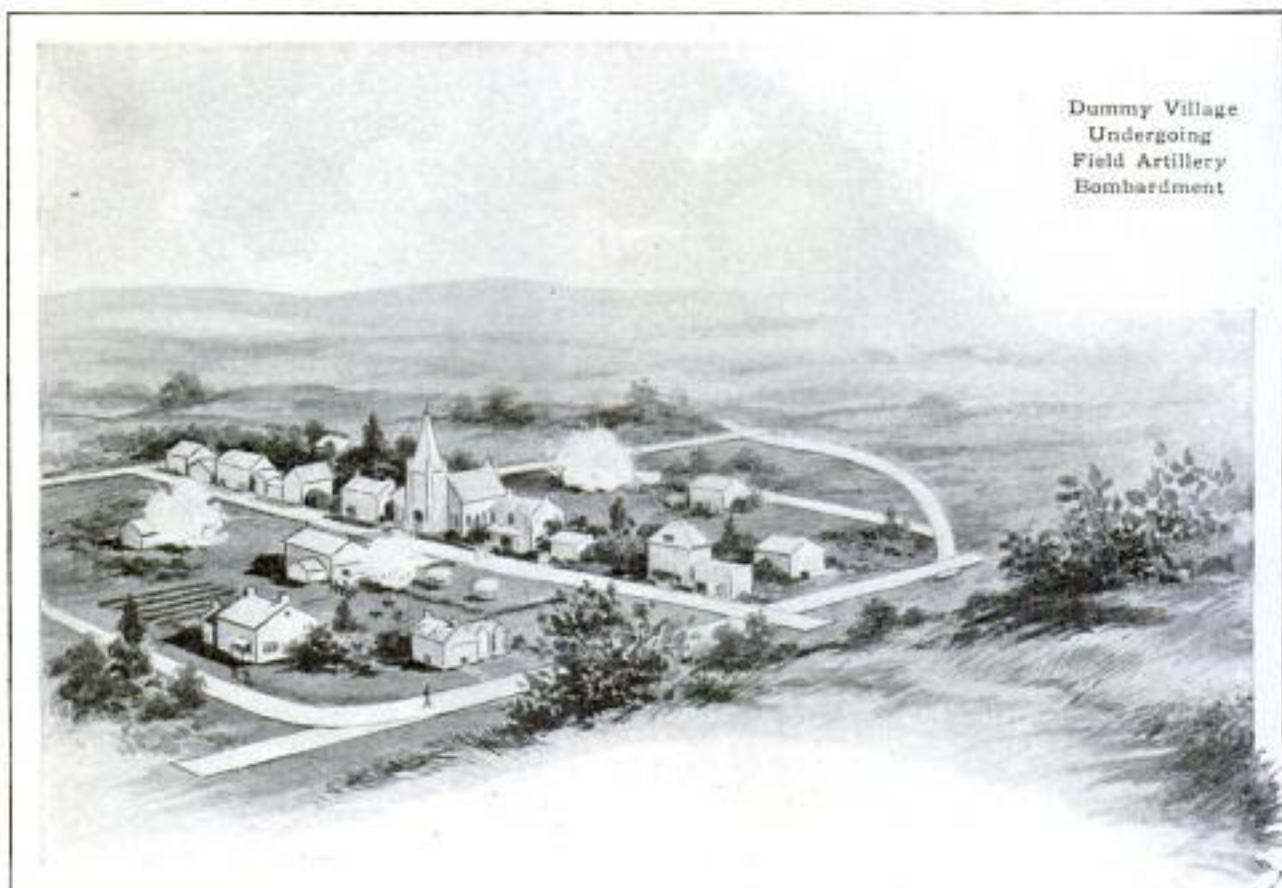
Railroading in the West continually presents new problems to the construction engineer, but the use of dynamite in place of a saw was tried for the first time on a Santa Fe bridge over the San Joaquin River, near Fresno, California.

Concrete abutments and piers had been built under an old wooden trestle-type bridge and the principal girders of the new steel structure prepared and riveted together at a distance ready to be lowered into place from derrick trains. All the earlier stages of the new bridge had been constructed with the wooden bridge as a falsework and without interruption to traffic. But the floor of the wooden bridge was 15 ft. higher than the new steel

structure was intended to be. To shorten the supports by sawing would take several days and tie up traffic.

The engineers got around the difficulty by running the derricks out to the proper points and then placing a small charge of dynamite in each of

the wooden supports of the old bridge just 15 ft. below the roadbed. The dynamite shots were discharged simultaneously, the old bridge fell, and the entire steel structure dropped into place at once. It took but three hours then to lay the ties and rails.



Dummy Village
Undergoing
Field Artillery
Bombardment

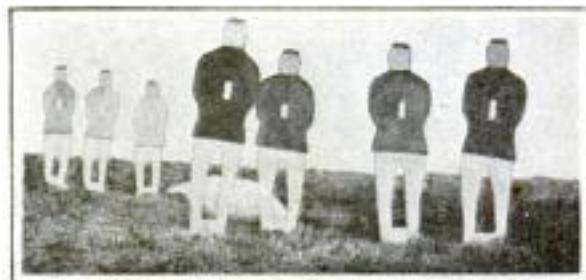
A DUMMY VILLAGE AS ARTILLERY TARGET

A fine example of the steadily developing idea of "more realism" in artillery target practice is forthcoming from England, where a dummy village was recently built as a target to be demolished by artillery fire. The village,

constructed of canvas, comprised several cottages, barns and outhouses, an inn, school, hospital, and a church having a spire 36 ft. high.

The dummy village was constructed near Okehampton, in a rolling country, and the batteries were concealed two miles away. On a hill a mile and a half away from the doomed village were stationed military observers with range-finding instruments, to direct the fire, and to watch the progress of destruction.

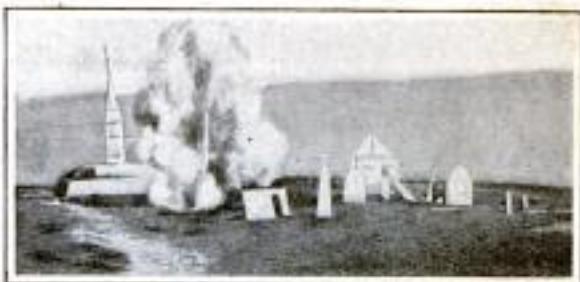
By the time three batteries had completed practice everything was demolished with the exception of the church



Dummy Men before Bombardment of Village

with its Red Cross flag flying, and the lyddite shells had blown great trenches in the street.

An American breakfast-food concern is considering the advisability of manufacturing a variety of their staple product from the taro root of Hawaii, which is used by the natives for the making of their well-known delicacy, "poi."



Shell Exploding, Photograph by Observer Half a Mile Away

ITALIAN MAIL BOXES EXCEL AMERICAN

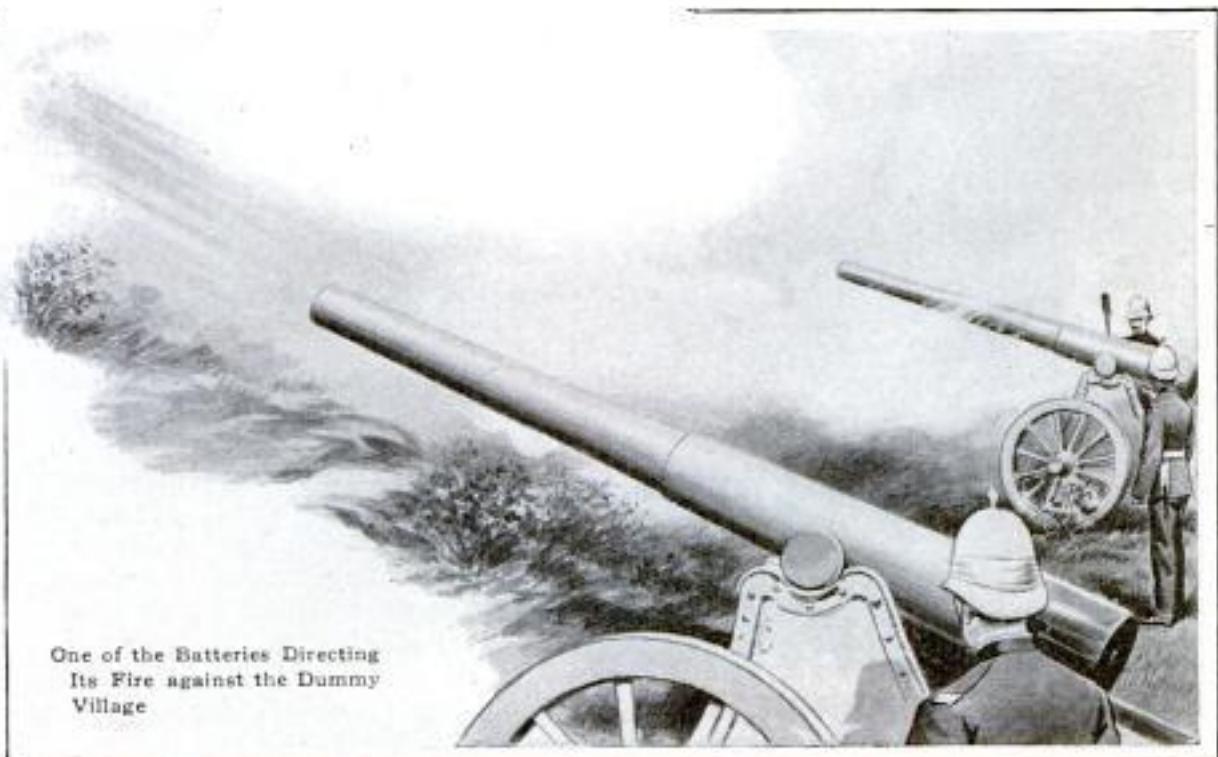
Apartment houses in Milan and Genoa are equipped with mail boxes which in many respects are superior to those found in American buildings of similar type.

The apparatus is situated in the halls or vestibules and has the front appearance of a door, the upper part of which consists of individual letter boxes, one for each tenant, besides which there is a separate box provided for outgoing mail to be collected by the postman. Each letter box is numbered and each tenant has an individual key which cannot open any of the other boxes. The postman carries a pass key which

opens all the boxes along his route. With one turn of his key he opens all the slits of the boxes as well as the collecting box, and causes to be thrown into view under the slits names of all the tenants. The placing of a piece of mail in a box automatically notifies the tenant by means of an electric bell. Simultaneously a white indicator drops underneath the slit of the box so that an absent tenant upon his return will know there is mail in the box, thus avoiding opening the box unnecessarily. The indicator disappears when the mail is withdrawn.

After distributing and collecting, a

One of the Batteries Directing Its Fire against the Dummy Village



touch of a lever at the base of the apparatus closes all the slits and the names disappear. The device assures safety and privacy, making it impossible for peddlers or solicitors to obtain the names of tenants, or local tradesmen to clutter boxes with advertising matter. Just how it would appeal to the man looking for a friend at midnight with only a street address to guide him is another story.

LONDON CHURCH SPIRE AS LINCOLN MEMORIAL

The American tourist, entering or leaving London from the Waterloo station, gets a close view of the church spire shown in the accompanying illustration. If the tourist is wide-awake and receptive, he or she may give a start of surprise. It has actually got stars on it, likewise stripes, but it is probable that no one on the train could tell off-hand what it means.

It is one of the ironies of history that this spire, erected in memory of Lincoln and remarkable as one of the most noticeable memorials to any native-born American outside the United States, stands half-forgotten already after so short a lapse of time. It rises to a height of 220 ft., surmounting Christ church, Westminster Bridge Road, made famous

for the preaching of the Revs. Newman Hall, F. B. Meyer, and other divines well known on both sides of the Atlantic, and was built by the united subscriptions of Americans and British in 1874. It cost \$35,000.

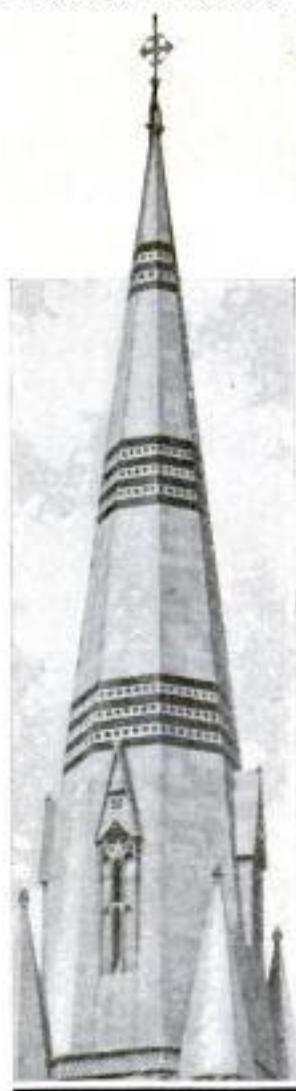
ELECTRICAL BRAINS FOR LOCOMOTIVE ENGINEER

An Australian inventor who has been working on the familiar lines of automatic stops for railroad trains has brought out an electrical signaling device which appears to do everything but think. The chief claim for it is that it will prevent the locomotive engineer from disregarding block signals. The tests which have been made of it seem to indicate that it will almost entirely remove the human element from block signaling and at the same time be free from many of the defects found in the systems now in use.

Suppose the apparatus were installed on a mile of single track between two sidings and that this track ran north and south. There is a train at each end approaching the single track. The station master decides that the northbound train shall have priority and so sets the control box at his end of the line. This control box is connected by a dead telegraph wire with "ramps" at each end of the section.

The northbound train proceeds and enters the section. The southbound train approaches the last part of the section on which it stands. As it does so it passes over one of the "ramps" and a shoe under the engine strikes it. Instantly a bell in the southbound engine cab rings an alarm. If the engineer ignores it, he is in trouble, for he passes over another ramp immediately and this automatically closes the throttle and applies the brakes. He can not get out of this predicament until he obtains a key to unlock the apparatus.

Meanwhile the northbound train has reached the ramps at the end of its section and received a warning of the same nature that the track ahead is





A Few of the Albatross Who Industriously Lay Eggs on Layson Island

The Eggs, Thicker Than a Bumper Crop of Potatoes, are Gathered in Wheelbarrows and Loaded into Trucks

not clear. If no attention is paid to the warning, the steam is cut off and the brakes applied.

Should an engine start out with a weak battery, should the telegraph wire be cut, or a short circuit result from any cause, the apparatus automatically stops the engine until repairs are made. Each time a stop of this kind is made the engineer must go to some authority for a key to unlock the mechanism, which would of course compel him to make a complete explanation.

The source of all power for this peculiar automatic signaling apparatus is a battery or generator carried on the engine. Batteries have been used on the engines which made the test on a standard-gauge track. There are no outdoor or fixed signals and this is said to reduce the cost of the equipment. Of course the trackwalker must be depended upon to keep the "ramps" free of snow in the winter time, but that is practically the only human element in the system.

EGG GATHERING WITH WHEELBARROWS

Egg gathering on Layson Island, a small rock in the Pacific not far from the Hawaii group, is a strenuous task, not in the seeking, but in keeping up with the egg producers and carting the eggs away. Millions of wild sea fowl, principally the albatross, make this island their home, and the eggs of this bird are collected in wheelbarrows, and loaded in trucks for transportation to the shipping point. About half a million albatross eggs are sold to the natives of Honolulu alone every season.

USING EARTH AS CONDUCTOR OF HEAVY CURRENTS

In adopting the Thury system of electrical supply for West London, experiments were carried on to determine the value of the earth for carrying heavy currents, which is a feature of this system. The object was to make sure that such use would not

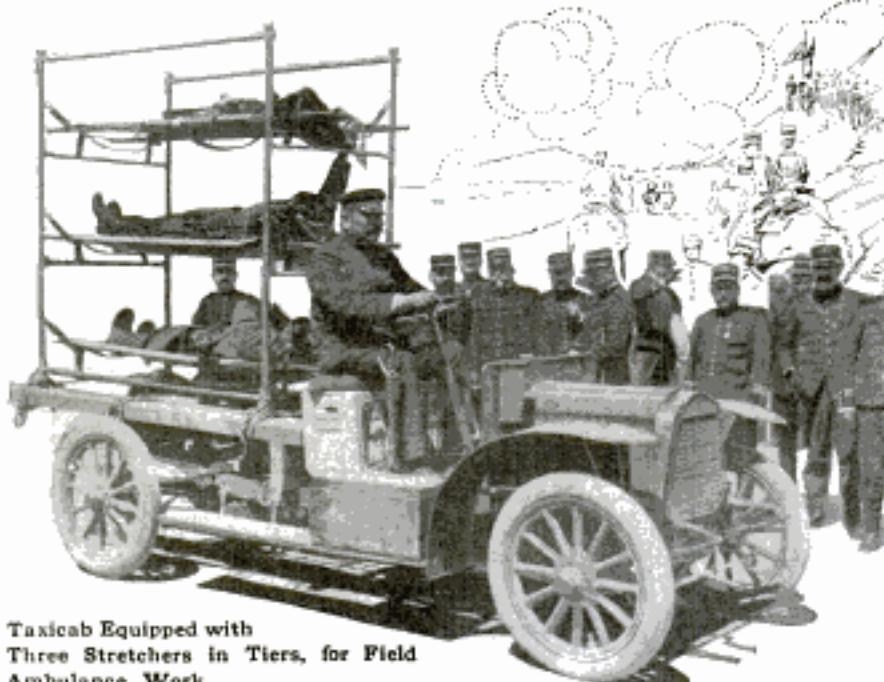
cause interference with other electrical systems nor result in damage to property. M. Thury had employed the method under consideration in Lausanne, Switzerland, with success, but in view of the different geological formation in London further experimentation was deemed necessary. It was decided that, in any event, the earth plates should be situated at a considerable depth below the surface and that connection with them should be made by insulated cables in order to avoid stray currents in the neighborhood of the plates. The experiments were aimed to ascertain to what depth the plates should be buried in order to escape induction, the size of plates to be used and their number,

the distance apart at which the plates should be placed and the strength and permanence of the earth resistance. Holes were bored, each having a diameter of 7 in. and an approximate depth of 35 ft. This gave a current of 33 amperes per plate and it was considered that the plates could carry this current for temporary use. For permanent use it was thought six plates would be required so as to reduce the current one-half. The earth plates consisted of cast-iron pipes having an outside diameter of 6 in. and a length of 9 ft. In one district of London the plates were buried in London clay, and at the other experimental point in fine gravel, which was in the main very dry.

MOTOR CARS FOR RED CROSS WORK

A surgical operating room equipped with many of the latest and most valuable appliances for aseptic surgery, all in a motor car, was one of the features of the recent French maneuvers. The car itself has a 40-hp. engine and can travel 20 miles an hour.

The big car has three compartments, the main room being the operating room, equipped with a modern operating table. Light is from above and around the sides are steel racks and closets for storing instruments



Taxicab Equipped with
Three Stretchers in Tiers, for Field
Ambulance Work

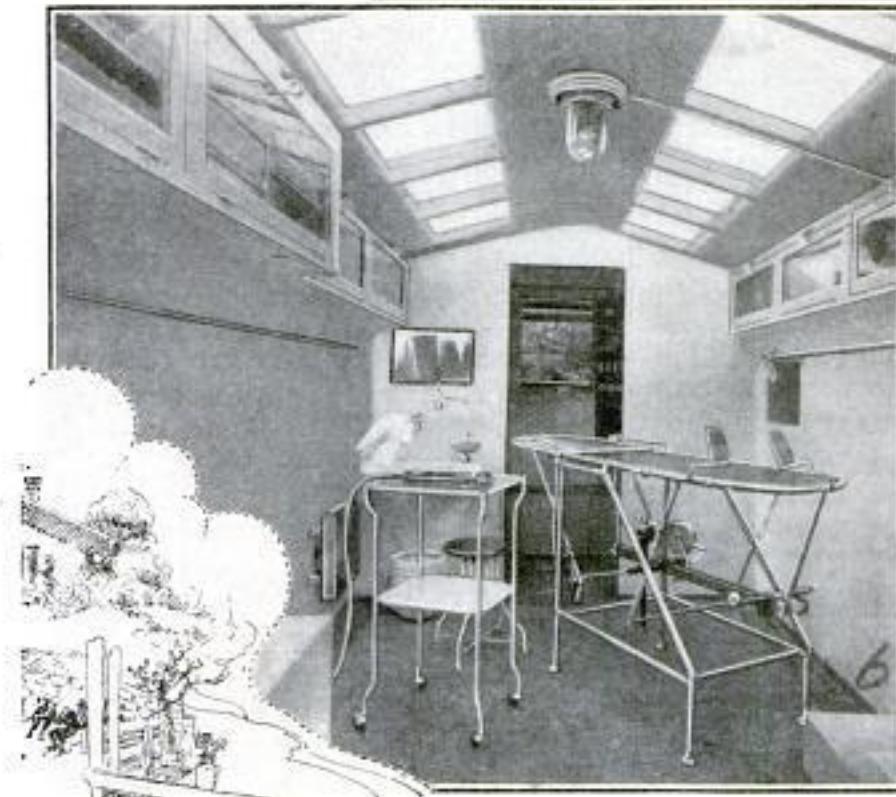


and other necessities. In a rear room is an X-ray apparatus, which, by an invention of M. Boulant, the designer of the car, can be used for making an X-ray examination of the patient while he is on the operating

table. In the front of the car is an electric dynamo, operating from the main engine of the car, for furnishing light and also current for an ultraviolet-ray water-sterilizing apparatus, which supplies water for hospital use and also for drinking pur-



Motor Car in French Maneuvers Equipped with All Modern Appliances for a Surgical Operating Room



Operating Room in the Motor-Car Hospital, Showing Operating Table and Overhead Light

poses, and has a capacity of 3,750 gallons in 24 hours. From each side

The most noteworthy of these ambulances are shown in the illustrations.

of the car a tent can be stretched out, furnishing room for cots for patients awaiting operations.

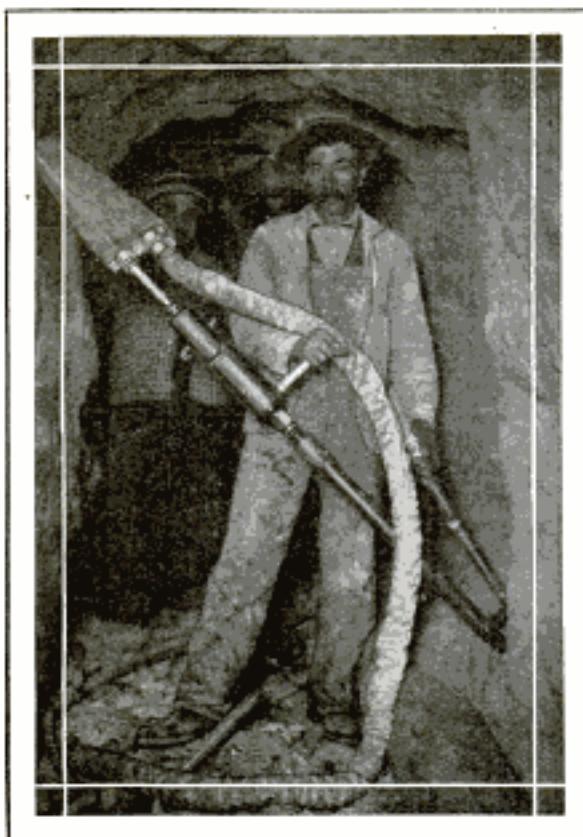
Many automobile ambulances for field use were tried at the same maneuvers, most of the attention being given to carrying as many stretchers as possible without crowding. One specially equipped car carried six patients, and a taxicab carried three stretchers in tiers.

DUST CATCHER FOR MINER'S DRILL

Dust from the operation of hammer drills in a mine is so apt to be a serious hindrance to work that a dust catcher has been devised in Leadville, Col., to be used when drilling in ore. It is said to increase the efficiency of the hammer drill 50 per cent and to minimize the danger from miner's consumption.

When the dust catcher is to be used, the hole is started with a bit, which drills a perfectly round hole to a depth of about 3 in., and the cone-shaped tube for dust catching is driven into this hole. The shank of the ordinary drill is then passed through a washer in the rubber end of the bag, the other end of the drill inserted in the tube and

the narrow end of the bag slipped onto the tube, whereupon the drill is fas-



Dust Catcher Attached to Miner's Hammer Drill
Ready for Drilling Operations

tened in the chuck of the machine, and the work can go on.

It is claimed that the elimination of the dust is practically complete in the drilling that follows.

Until a few years ago hammer drills were scarcely used, so that the miner had little or no dust to contend with, but with its introduction trouble began. The miner is injured by "eating dust" which eventually may develop into miner's consumption; the mine owner suffers loss of money, because whenever a miner drills a hole and is ready to change the drill, he must leave his work and get fresh air before he can continue, which means a loss of from 15 to 30 minutes on each hole drilled.

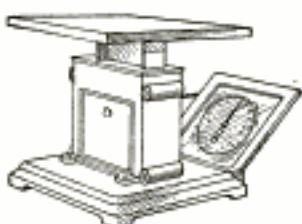
Former Fire Chief Edward F. Croker of New York is constructing a residence for himself that will be absolutely fireproof.

SWEDEN PROFITS BY WATERFALLS

That strict conservation of its water power is the aim of Sweden is shown by the maintenance of a waterfalls board which is engaged actively in the development of this source of national wealth. During the next 10 years several million dollars will be expended in carrying forward the plans for development outlined by the board. This expenditure is placed at about \$4,000,000 for each of the years 1913-14-15; and between \$2,500,000 and \$3,000,000 for 1916 and 1917. For the remaining part of the decade the expenditures will not exceed \$2,000,000 a year. The estimated revenue shows a continuous and rapid rise, from about \$300,000 for 1913, to over \$2,000,000 in 1923. Of course, only a nominal revenue will be received from falls bought for generating current until they are adequately exploited, but the board may decide to take over for development other falls for electrification of certain sections of state railways.

PLATFORM SCALES IN SIMPLE FORM

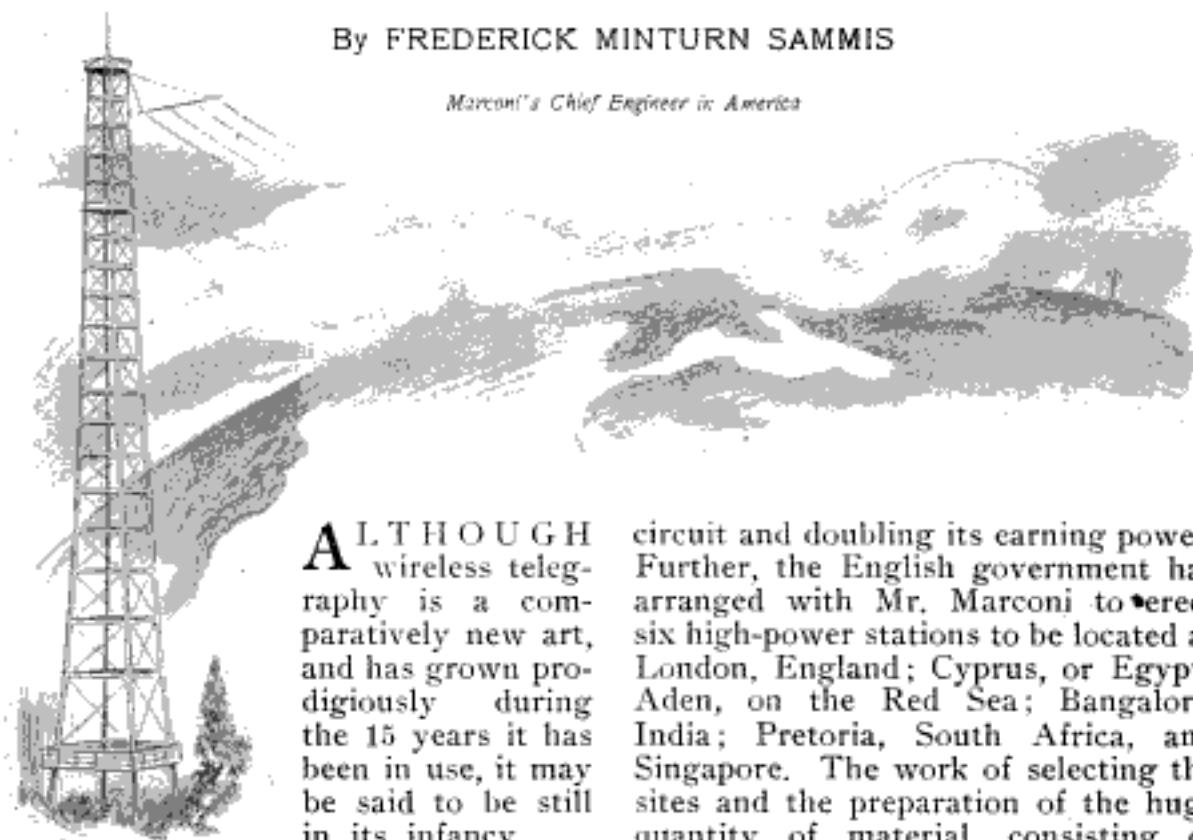
The increasing practice of people of weighing themselves daily, preferably after rising each morning and before dressing, has led a Frenchman to devise a scale which takes up very little room and is not expensive. The scales are of the same appearance as ordinary letter scales, though built very strongly so as to carry and register 275 pounds. A mirror inclined at an angle of 45 deg. enables the person standing on the platform to read the figures indicated by the pointer on the dial. An arrangement is attached by which the spring can be adjusted after continued use has altered its original tension.



AROUND-THE-WORLD WIRELESS

By FREDERICK MINTURN SAMMIS

Marconi's Chief Engineer in America



ALTHOUGH wireless telegraphy is a comparatively new art, and has grown prodigiously during the 15 years it has been in use, it may be said to be still in its infancy.

Within the last few months plans have been consummated for completely encircling the earth with a great chain of high-power Marconi stations.

In 1901 Mr. Marconi had completed a station at Cornwall, England, which for those days was considered colossal. From this plant of a hundred horsepower the initial experiments across the Atlantic were conducted. Mr. Marconi proceeded to Newfoundland and by means of a kite succeeded in elevating a copper wire to a considerable height and with this temporary receiving antenna he was able to detect the now famous letter "S," that was being sent by the powerful transmitter in England. At Glace Bay, Nova Scotia a powerful station was then erected after much testing and remodeling, was opened for commercial service and for the past few years has worked daily, across the 1,700 miles of ocean, with the station at Clifden, Ireland. An additional site has just been acquired a few miles from the present Glace Bay station in order to make possible the simultaneous transmission and reception of messages, thus duplexing the

circuit and doubling its earning power. Further, the English government has arranged with Mr. Marconi to erect six high-power stations to be located at London, England; Cyprus, or Egypt; Aden, on the Red Sea; Bangalore, India; Pretoria, South Africa, and Singapore. The work of selecting the sites and the preparation of the huge quantity of material, consisting of masts, engines and apparatus, has already begun and some idea of the magnitude of this work may be gained when it is considered that about 500 hp. will be required to operate each of these stations and that, exclusive of land, buildings and foundations for machinery, they will cost \$300,000 for each station.

To the layman, a wireless station consists of a small and insignificant hut containing the wireless equipment and one or two masts or towers supporting the aerial wires, but it is probable that comparatively few readers have seen any of the really large Marconi transatlantic stations. These monuments of the inventive mind and untiring zeal of Guglielmo Marconi cover tracts of land over a mile in length upon which are erected a large number of huge steel masts which, in some instances, are 400 ft. high. The masts support a network of copper wires. These wires perform a dual function. When they are connected with the transmitting apparatus or spark gap they shake, with a mighty electrical force, the ether surrounding them and cause electromagnetic waves

to become detached and travel away into space. When connected to the receiving apparatus they become the ear instead of the voice of the system and collect the vibrations that have been hurled into space at lightning

which, in conjunction with the stations being erected for the English government already referred to, will provide a commercial service that will encompass the earth. This station will be near New York City, at Belmar, N. J.,

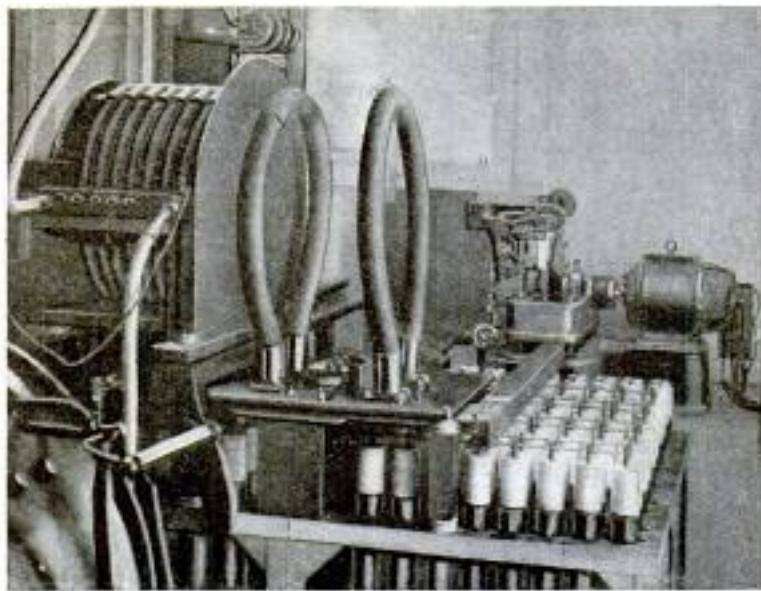
where 500 acres of land have been acquired upon which the masts and plants will be erected. Transmission will be effected to the Panama Canal Zone and thence to Hawaii.

The Hawaiian station will be one of the most powerful of the entire group, for besides communicating with the station at Panama, it will be capable of working with San Francisco and the Philippine Islands, and with a station to be erected later in New Zealand. The Manila

station is the last of the

American group and will connect to the east with the Singapore station of the English group. Unbroken communication will be maintained successively through the stations at Bangalore and Aden. At the latter station we may turn southward over the huge mountains of Abyssinia and the wilds of German East Africa to communicate with Pretoria in South Africa. It is probable that the station at Pretoria will be called upon to communicate with the proposed high-power station at Buenos Ayres, soon to be started.

Retracing our steps to Aden on the Red Sea, we may talk with the station in Egypt to the north, and thence, by one tremendous leap, hurl a message with such force that it will cross the wide Mediterranean, ascend the boot of Italy, scale the ice-crowned Alps and drop quietly into London, all in less than one two-thousandth of one minute. Having arrived in England, we may take the present busy route from Clifden, Ireland, to Glace Bay, Nova Scotia, in order to talk with our

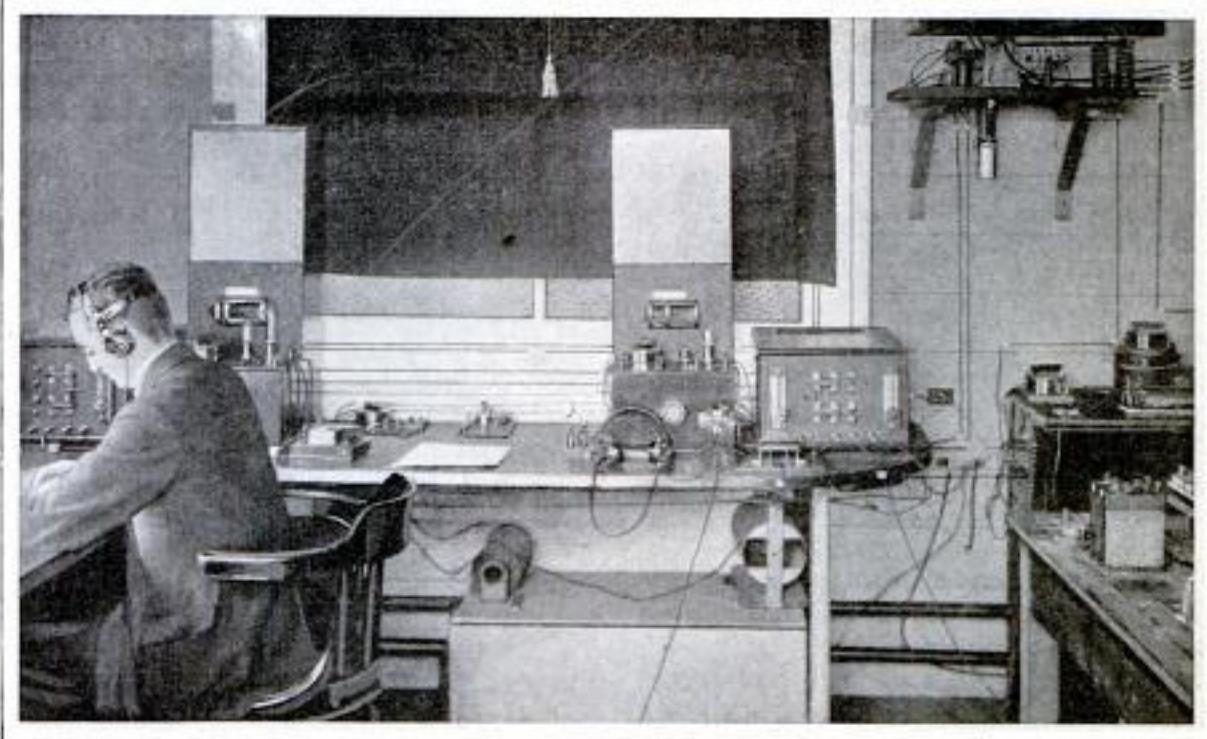


To Help Out the Big Stations are Medium-Power Feeder Plants, of Which This is an Example

speed by the distant station and lead them down to the sensitive receiving apparatus which corresponds to the drum of the human ear.

It has been found practicable, by arranging the aerial wires in a particular direction, to cause the waves to travel almost entirely toward one point, whereas the old method sent them out in all directions like the waves caused by dropping a stone in the center of a pond. It will, of course, be evident that this improved method of working can only be utilized where fixed stations are concerned, and that ship stations and those shore stations that work with the ships must continue to use the original antenna, or aerial, that works equally well in all directions.

Until the present time our country has not been entitled to boast of a real high-power station, but now plans have been finished that will place the United States in the first rank with respect to both size and number of these modern high-power stations, and



One of the "Stepping Stones" in the Wireless Circuit of the Globe: the Operating Room of the Clifden, Ireland, Station

Canadian neighbor, or we may utilize the new and more powerful station at London. By this means we arrive once more at our starting point at Belmar. Thus with but nine stepping stones, we may trip around the earth. Still further stations are contemplated: in fact, the chain that girdles the globe will be but the main artery of a great system. Feeders and branch stations will be established in all countries and a very comprehensive chain will be erected in South America in the near future.

With the establishment of this great network of stations will come an era of cheap communication, for wireless telegraphy may easily reduce the present cable rates. The cost of a submarine cable to cover a distance of 3,000 miles is anywhere from \$7,000,000 to \$10,000,000, while the total cost of a pair of wireless stations to do the same work is but \$600,000. The cable must handle a half million dollars worth of business in order to earn enough to keep it in repair, while two per cent of this amount will take care of the same item for the wireless. Two million words at 25 cents a word will earn only a sufficient sum to cover deprec-

ation of the cable, while the same number of words at half rate by wireless will produce enough to pay the depreciation charge and 35 per cent on the investment besides.

I have purposely omitted the cost of operation for there is little difference between the two systems. It is true that the actual cost of operation of the wireless system is higher than that of the cable, but the cost of repairs and upkeep on the cable are vastly higher than with the newer system. A cable company must keep a repair steamer, worth some \$250,000, ever ready to sail out over the 3,000 miles of submerged cable in order to locate a break or fault and make the repairs, while the wireless station covers but a few acres and repairs are quickly and cheaply made.

The wireless system, in using nature's ether as a conductor, has provided itself with a medium that requires no repairs. At a high-power station one cannot help experiencing a weird sensation at this power to communicate from one continent to another over vast stretches of ocean with naught between, other than nature's ether. Without wire or cable to convey an electric current and a complete

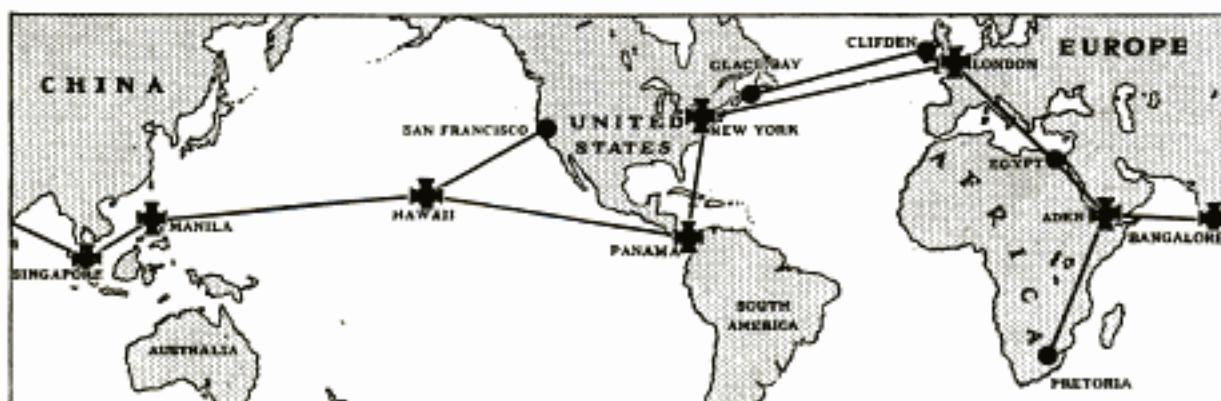
absence of anything that is perceivable by the five senses, it seems a marvelous thing to be able to communicate with a distant land. Yet it is more easily understood when we consider that we have borrowed for our use a voice of lightning that will speak thousands of miles with a single flash, and with apparent ease send its unseen and unheard vibrations through daylight and dark, through storm or calm, over mountains and seas and even directly through those substances which we have learned to think of as solids, with the exception, however, that they refuse to penetrate conductors of electricity.

Surely, we have here an accommodating servant by means of which we may from a single station talk with nations, north, east, south and west; we need no wires, no cables, no right of way and none of the expensive upkeep or repair that the older forms of communication require.

The engine room of the great station at Clifden, Ireland, is a fair example of the stations now planned. Each station has a complete duplicate set to guard against interruption of the service by accidental breakdown, for the handling of messages must continue day and

night from one year's end to another, and even an engine and dynamo are sufficiently human to require an occasional rest. Near the engine is located the buildings that house the condensers. A condenser in wireless telegraphy is a device that stores up the electric energy until the operator by pressing his key sends it hurrying away to do his bidding. The entire plant, which may cover many acres of ground, is at the instant control of the operator who is stationed in a little bungalow quite separated from the power plant, but in absolute control of its machines by means of underground cables that operate switches in the main power plant.

Certainly the operator at such a station as the one building in Hawaii is an autocrat. He may tell the far-away station in the Philippines to proceed or to wait, or he may at the same moment talk to the San Francisco station and receive from the Philippines, or he may so arrange his automatic transmission and recording apparatus as to receive simultaneously messages from Colon and the Philippines, while at the same moment transmission to San Francisco is taking place from his own station.



HIDING THE DOTS IN HALF TONES

Such obvious disadvantages, indicated by newspaper pictures, are inherent in the ordinary half-tone engraving process, by which the picture

is made up of tiny dots in straight lines, that investigators all over the world are seeking an improved method. A new idea has been worked out by

Dr. Hans Strecker, according to the *Scientific American*.

He first prepares a mixture of gelatine and gum arabic, the gum forming in tiny globules, instead of mixing with the gelatine. The mixture is then coated over a copper or zinc plate which has been made sensitive to light in the usual manner. The coat hardens and so forms a film over the plate, of transparent gelatine, filled with tiny globules of gum, very uniformly distributed, but not very transparent. A photograph is then taken on this coated copper or zinc plate, the light affecting the plate through the transparent gelatine, but not through the globules of gum, exactly as an ordinary half-tone plate is photographed through a screen to get the dots. In the case of the new process, the image on the plate is also in dots, of course, but not in a regular pattern. The plate is then etched with acid in the usual

A Wooden Lion Whose Interior is a Beehive



manner, leaving an engraving cut which also gets its printing effect from tiny dots, but by reason of the less orderly distribution of the dots, they do not attract the eye so strongly as those of the common half tone, and the resulting print takes on a more lifelike appearance.

It is possible to vary the distance apart of the tiny dots so as to adapt the engraving cut to any kind of print paper.

UNIQUE GERMAN BEE COLONY

Instead of the usual simple hives, all alike, a German keeper of bees has provided them with real residential abodes, as well as hives in the shape of wooden "wild" animals. In the gar-



One of the Beehive Residences of a Quaint Bee Colony in Germany

den are several miniature houses representing an inn, castle, railway station, and residences grouped around them. All the small details, such as chimneys, doors, windows, and the like, are carefully modeled in architectural proportion.

FIRE-ALARM GONG OPERATED BY SPRINKLER SYSTEM

An eastern firm has recently placed on the market an automatic device to be used in connection with a sprinkler system which will ring a gong on the outside of a building as soon as the fire starts the sprinkler working. A valve, installed in the main pipe of the sprinkler system, is subject to the entire water pressure as soon as the sprinkler starts to work, and this allows a small portion of the water to drop on the buckets of a water motor inside the wall. The shaft of the motor extends through the wall and brings a rotating striker in contact with the gong.

LUMINOUS OUTFIT FOR NIGHT MARCHING

Luminous field compasses, luminous marking disks to be worn on the backs of the column leaders, and



Compass Made Luminous by Radium for Military Operations at Night

Column Leader Wearing Luminous Disk as Guide for Following Soldiers

—
pocket electric lights which will enable mounted troops to march on the darkest nights with the same accuracy as during daylight, will be adopted by the United

States cavalry, if experiments which are now being made at Fort Oglethorpe, Ga., prove their worth. The new appliances and equipment have been recommended by the Cavalry Equipment Board which recently met at the Rock Island arsenal where preliminary tests were made. The tests at Fort Oglethorpe will extend over six months and be made under conditions as severe as any encountered in actual warfare.

The equipment board has recommended that hereafter each regimental and squadron headquarters be supplied with luminous compasses of a type similar to those supplied to the armies of other countries, which have been found to be of great value in marching across a dark and unknown country at night. In the compasses, the usual in-

dex line and outside circle of degrees is retained, but instead of the dial being painted with luminous paint, which needs exposure to the sunlight or to a magnesium ribbon in order to render the compass luminous at night, the index line is treated with a composition in which radium enters as a constituent and which needs no exposure but is always ready for night work and retains its luminosity for an indefinite period.

In the tests at the Rock Island arsenal the luminous compass was used on a 500-mile march and also luminous disks of considerable brilliancy, made of waterproof cardboard, thickly coated with luminous paint and attached to the back of a column leader by means of pieces of tape. It was found that by these means the mounted troops could march with great accuracy and speed. When soiled the disk can be sponged off with lukewarm water and used many times before repainting is required. To excite luminosity, the disk must be exposed to bright daylight.

The use of pocket electric lights about 5 in. long and covered with durable leather is also recommended. It is believed the light will be useful to troop commanders in conducting night operations with other troops or even independent night operations on a small scale; and in reading dispatches, examining crossings and banks of streams before fording. The lights will be so constructed as to be proof against wet weather and tropical temperatures.

The board has also recommended that the bayonet be added to the trooper's equipment, so that in case he is unhorsed, he will be as efficient as an infantryman. The type of bayonet recommended is not unlike that used in other branches of the service, but about 4 in. shorter and not quite so heavily constructed.

—
A western railroad company has not only given its employes thorough instruction in first aid to the injured, but has equipped its trains with the so-called "first-aid" packages.

PREVENTING EROSION OF PROPELLERS

"Turbodium" is the name given an alloy, produced after numerous tests, which is now successfully used to prevent erosion of propellers of turbine-driven vessels. In laboratory tests it showed an endurance of 140 hours, as against 24.7 hours for the ordinary high-tension bronze, which also has been used for the same purpose. The test has been confirmed by use of the alloy for periods of six months to three years, propellers so protected having shown no evidence of erosion after the lapse of these varying periods. Before turbines were introduced, manganese bronze temporarily solved the problem of preventing erosion in the earlier type of propellers, but with the use of the new-style engines, an alloy of greater resistance was required.

GETTING READY FOR AERIAL INVADERS

The possibility of an aerial invasion of England has occupied the attention of British military authorities since the first aeroplane crossed the English Channel. The accompanying il-



Model Aeroplane Target with Dummy Pilot in Full Flight as It Would Appear to Marksmen on the Ground

The Way in Which the Model Aeroplane is Attached to the Rope Before it is Released to Become a Target

lustrations, used by courtesy of the Illustrated London News, show that preparations are being made to give the first soldier-birdman a warm reception.

To gain practice for such a contingency a model aeroplane, 10 ft.

long, has been mounted on a wire stretched across the rifle range in Broadhead Valley, Entwistle, near Bolton. The model carries a dummy pilot which becomes the target during maneuvers. In practice the model, out of sight of the attacking force, is released by means of a rope and passes over the riflemen at full speed. During a recent trial the "pilot" was hit by a bullet at a distance equivalent to 1,000 yd. for a full-size aeroplane. Another shot struck the machine but missed the dummy driver.

ASK BIDS TEN YEARS IN ADVANCE

The city of Dublin in asking bids on arc lamps has given the manufacturers a big problem. The specifications call for bids on 500 lamps to be delivered at the rate of 50 a year for 10 years. The lamps are to burn in series of 22, and the makers have been asked to submit one series for a six-months' free test on the same circuit as the lamps now in use. These difficulties might have been overcome, but the makers refused to bid when they found that the specifications provided that each light must have a heavy sheet-copper case. They said it was impossible to forecast the price of copper for 10 years in advance.



SKY-SCRAPING PHOTOGRAPHS



These pictures of structural steel workers at work were taken at a greater height than any photographs of this kind ever were before. In this particular instance the camera man mounted to the top of the central tower of the lofty new Woolworth

Photos Copyrighted



OF SKY-SCRAPER BUILDERS



Building in New York and made snapshots of the workmen around and below him, the man who seems to be on top of a tower being at the apex of one of the four smaller pinnacles, while the others are at various points along the giant frame.

Brown Bros., New York

MICROBES FROM DOGS TO PROLONG LIFE

In making his recent announcement that he had found microbes in the intestines of dogs which are hostile to



Culture of Life-Prolonging Microbes Found in Dogs

the microbes charged with bringing on premature old age, Prof. Eli Metchnikoff showed the French Academy of Sciences cultures of these friendly microbes. Professor Metchnikoff considers

this discovery of his a long forward step in his famous efforts to find means of extending what is the present apparent normal span of life.

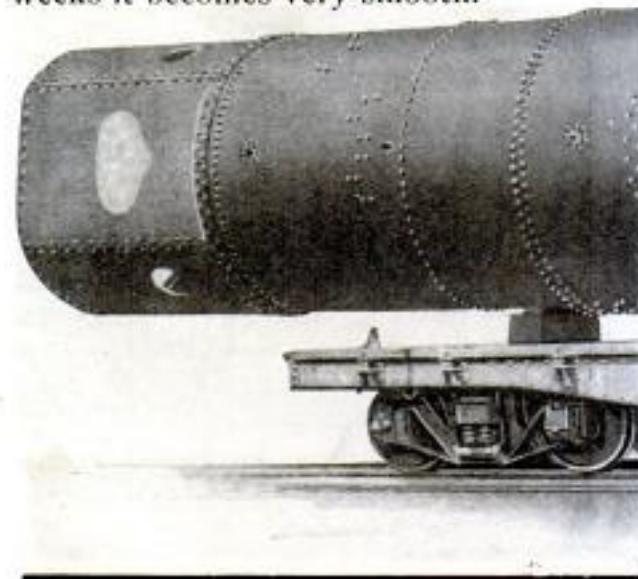
Professor Metchnikoff and Doctor Wollman, his collaborator, have become convinced in the course of their recent investigations that it is in the herbivorous or non-flesh-eating animals the harmful microbes are developed in greatest numbers, and that this will apply to people who are strict vegetarians, while in persons using a mixed diet comparatively few are found. In announcing his discovery of the friendly microbes in dogs Professor Metchnikoff issued a warning against considering his discovery as yet anything more than laboratory experience, and entirely preliminary, and against any unscrupulous exploitation of his discovery.

MOST POWERFUL LOCOMOTIVE IN THE WORLD

The Mallet locomotives just built for the Virginian Railway are claimed to be the most powerful in the world. The locomotive and tender weigh 752,000 lb., the fire box is large enough to hold a donkey switching engine, and the weight on the 16 driving wheels is estimated to be 479,200 lb. It is estimated that these locomotives will haul 155 loaded 50-ton freight cars at 10 miles an hour.

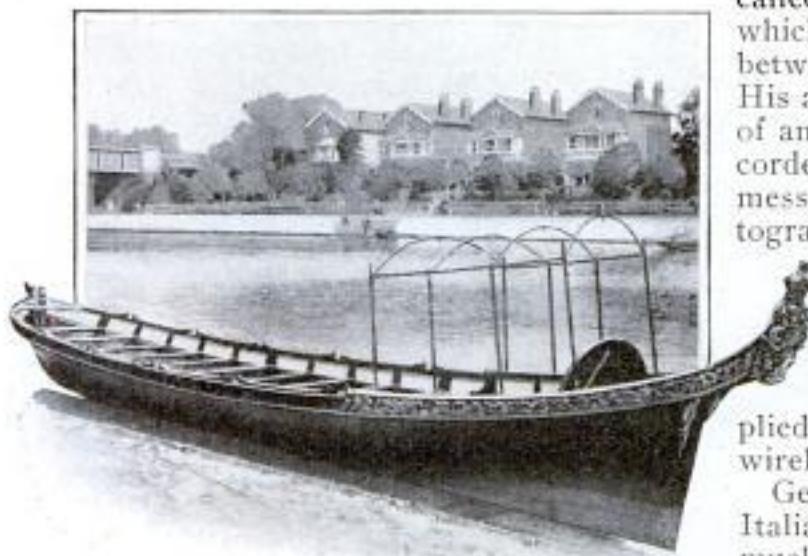
STREET PAVING LIKE MOSAIC FLOOR

Because of repeated unsuccessful efforts to find a satisfactory pavement for heavy traffic, the engineers of the city of New York are preparing to lay a new form of granite block, known in Europe as "durax pavement." In the continental cities it has proved stronger and more durable than any other type of paving, and New York hopes to benefit by their 20 years' experience with it. Its lasting qualities are due to the fact that the surface blocks are small, carefully fitted by hand, and so arranged that none of the joints is at right angles to the moving lines of traffic. This produces an almost noiseless surface and gives a good foothold for horses. The blocks are made of granite, cut in cubes about 3 in. on each side. On a bed of ordinary dirt or clay, which is pounded down hard with a 10-ton roller, a foundation of concrete, 6 in. or more according to the weight of the traffic, is laid, and over this is a $\frac{1}{2}$ -in. bed of granite chips. The granite cubes are then laid on top and fitted together as evenly as possible. The interstices are filled with pitch. When completed, the street looks like a great piece of mosaic, the lines of the cubes curving off into regular arcs in various directions. The surface at first is slightly rough, but after a few days or weeks it becomes very smooth.



THE KING'S BARGE FOR THE HENLEY REGATTA

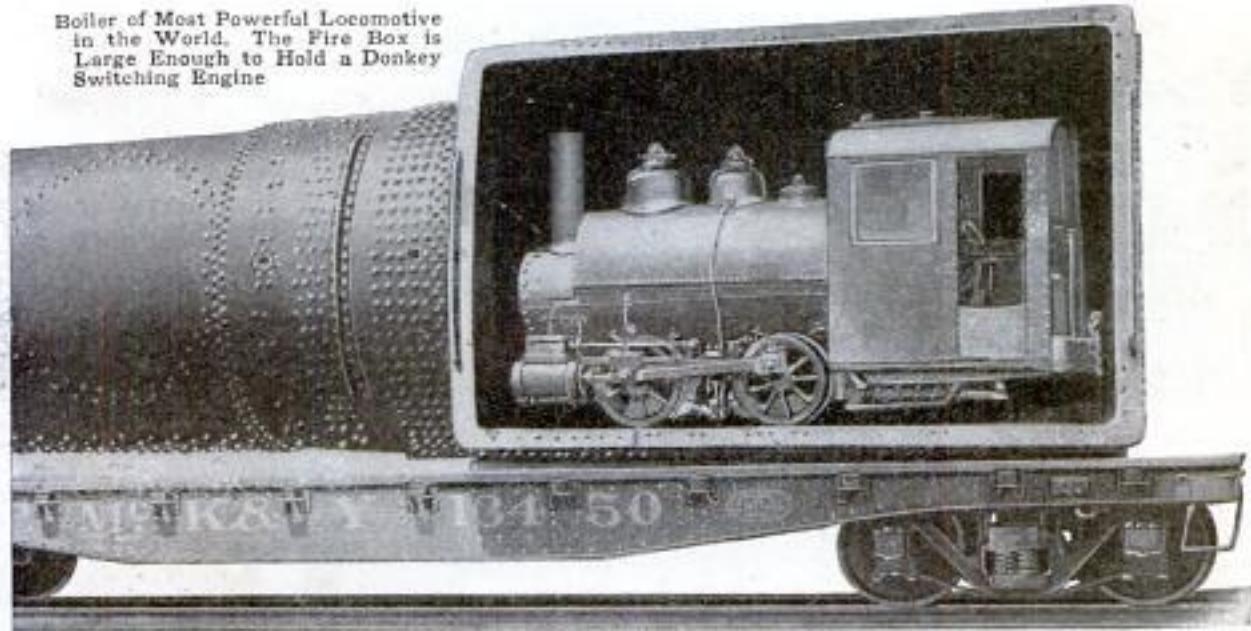
The royal barge which was originally built by William III, of England, for the use of his consort, Queen Mary,



The Royal Barge of William III, of England, Undergoing Redecoration for King George

some 200 years ago, was thoroughly overhauled before the Henley Regatta, which is the premier water event of the season in England.

Boiler of Most Powerful Locomotive in the World. The Fire Box is Large Enough to Hold a Donkey Switching Engine



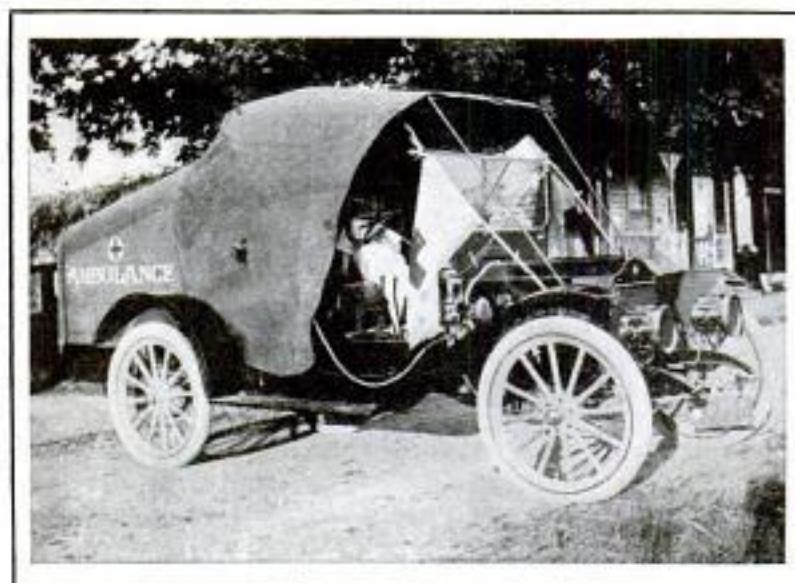
TRANSMITTING SKETCHES BY WIRELESS

Surprising results are being obtained by means of the new invention of an Italian youth, Francesco di Bernocchi, called the wireless iconograph, which has recently been tested between Milan and Turin. His apparatus is far in advance of anything of the kind yet recorded. Besides ordinary messages, it also transmits autographs, shorthand characters and all sorts of designs. So simple is the arrangement that the transmitter and receiver of this instrument may be applied with ease to any ordinary wireless telegraph plant.

General Spingardi, the Italian minister of war, is so much impressed by the enormous advantages of the wireless iconograph for transmitting orders and conveying sketches in time of war with the utmost secrecy, that steps were immediately taken to secure for the Italian government exclusive possession of the patent.

AN IMPROVISED MOTOR AMBULANCE

A physician at Wildwood, N. J., has converted an automobile into an ambulance, as shown in the accompanying photograph. The rear end of the ambulance is 3 ft. high with isinglass set in the top cover to give light to the patient. An opening back of the seat permits conversation between physician or driver and the patient. The ambulance is used in connection with a seashore emergency hospital.



Physician's Motor Car Converted into Ambulance

DYNAMITE DOES WORK OF SLEDGE

Expedition in making repairs is a thing devoutly wished when the water supply of a big industrial plant is temporarily shut off. With this in mind the waterworks manager of Birmingham, Ala., has adopted the use of dynamite in place of sledges for breaking cast-iron pipes when it becomes necessary to dislodge them. A quarter to one-third of a stick of 40 to 60 per-cent dynamite is placed on top of the main and covered with clay. Usually the blast blows out a small hole or starts a crack. Further shots are then exploded, working toward each end of the pipe. In some instances pipes thus removed were 2 in. thick and the dyna-

mite method was found much more rapid than the old way of attacking the pipe with sledges. In doing this work electric exploders are recommended as they may be used with greater safety and are more convenient than fuses.

PHOTOGRAPHING ANIMALS UNDER WATER

Photographs of otters and water birds of various kinds have recently been obtained with a moving-picture camera by Dr. Francis Ward, of Ipswich, Scotland. In order to get the pictures and remain unobserved by the animals Doctor Ward built a concrete tank fitted with a window and mounted his camera in an underground room behind the aperture.

Among the pictures obtained are those of an otter engaged in a fish hunt, herons, penguins, black-backed gull and a water hen. The penguin was observed as a fisher, the photographs disclosing clearly how the bird uses his wings

as oars both on the surface and while under the water. The air bubbles in the feathers of the water hen convert it into a mirror in which are reflected the colors of its surroundings. The fish are seen swimming around the legs of the heron which piece of carelessness enables the bird to gain a square meal without undue exertion.

DISINFECTING WATER BY ELECTRICITY

Satisfactory and economical disinfection of swimming tanks has been accomplished by the municipality of Poplar, England, by means of an electrical discharge into the water which renders it sterile. The cost of the in-

stallation required for this purpose, it is said, was more than repaid by the saving of expense for disinfectants of the usual kind that had been employed previously. The effect on the water is not such as to make it unpleasant for the bathers. An English physician states that considered as a possible means of infection, it is a matter of surprise that comparatively little attention heretofore has been drawn to the dangers lurking in swimming baths.

CARRYING A LOCOMOTIVE ON A CABLEWAY

The giant hands that are refashioning the surface of the earth at man's bidding do something more than merely pile up heaps of rock in river courses that the streams may be diverted to fields where water is needed, or tunnel through mountains or level off hills. Recently it was necessary to carry a railway locomotive from one side of the Rio Grande River to the other in connection with the construction of the Elephant Butte dam. To run the engine on rails to the nearest switching point and thus get it to its destination would take too long. So the power that has been trained to exert itself at the twist of a switch or the turn of a throttle was called into play and it picked up the engine and carried it across the river. There was a cableway of steel ropes stretched from one side of the river to the other for the purpose of transporting material as needed. The cable swings 300 ft. above the surface of the river. The locomotive, a 20-ton affair, was equipped with slings which were in turn attached to the travelers on the cable and it was easily and quickly transported from one side to the other.

The illustration of the Galveston causeway in the August issue of this magazine, through an error of omission was not credited as it should have been, "Copyrighted, by Maurer, Galveston."



Copyright by Illustrations Bureau, London
Canary in Bird Cage, Appearing in English
Bicycle Meet

GROTESQUE MAKE-UPS FOR BICYCLISTS

Bicycle meets still persist in England. Two quaint figures mounted on bicycles were features of the fifteenth annual meet of cyclists held recently at Woodford, England. One of the riders represented a canary, while the Mother Goose character, Humpty-Dumpty, mounted on the famed wall, operated the pedals of the other bicycle.



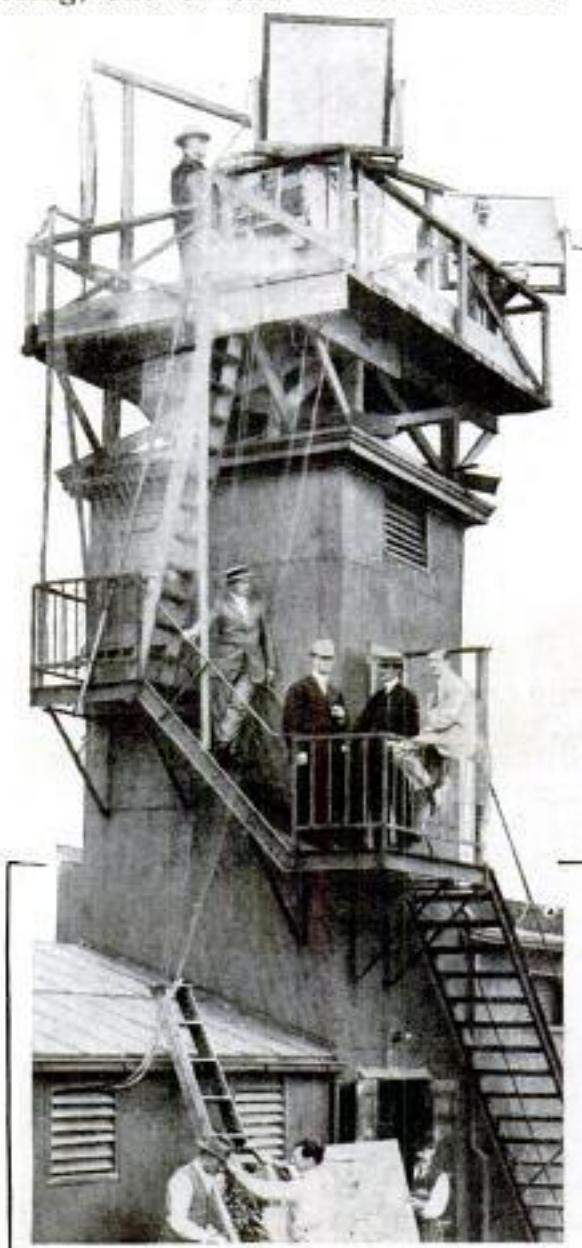
Copyright by Illustrations Bureau, London
Humpty-Dumpty Sitting on His Wall and
Riding a Bicycle

VARI-COLORED SEARCHLIGHT DISPLAY IN BALTIMORE

Shafts of white, red, green, orange, pink and yellow light, projected by an immense searchlight mounted on top of the Fidelity Building, one of the highest points in downtown Baltimore, have been attracting the attention of visitors in that city. The desire to produce spectacular effects other than those attainable with white light led to the construction of the apparatus that afforded an alternating rainbow of light more startling than the coat of Joseph.

The apparatus, which is shown in the accompanying photograph, consisted of a supporting platform, the searchlight proper, a motor for revolving the light, four large oscillating mirrors and four color screens. The mirrors were placed one each at the four corners of the platform railing. Each mirror was held by a universal-jointed frame so constructed that any or all of the mirrors could be set at any desired angle to the beam of light. Over the center of the searchlight was hung a horizontally revolving wheel or frame carrying the color screens. Each of the screens projected perpendicularly downward a sufficient distance so that its center corresponded with the cen-

ter line of the horizontal searchlight beam. With the searchlight revolving automatically in connection with the inclined mirrors the operator rotated his color screens. Instantly the beam, however deflected, became surcharged with color. The beam of light projected was 24 in. in diameter.



Searchlight Color-Flashing Apparatus on High Baltimore Building

NEW GAS ENGINE FOR BATTLE-SHIPS

The new marine engine, invented by Dr. H. Junkers, professor of the Aachen (Germany) Technical Highschool, is advocated by its creator as being suited not only to commercial vessels but also to battleships. In a paper read by Professor Junkers before a technical society recently he indicates how his engine was evolved from an earlier German type of

gas engine. Included in his paper were drawings showing the theoretical distribution of engines for a 26,000-ton battleship of 45,000 hp. Four shafts are provided, each unit consisting of a six-crank engine with its compressors. Comparison is made between the Junkers engine, which in this case

is of the tandem type, and engines of the ordinary double-acting variety, the power per crank in each case being assumed to be 1,875 hp. Objection has been made to the Junkers engine by engineers who have asserted that it would be very high and therefore suited only to big cargo vessels of comparatively low power. In these plans the adoption of a short stroke, rendered possible by the double-piston principle, makes the engine lower than the double-acting type.

ARTISTIC UMBRELLA ROLLER

An umbrella folded clumsily is about as ungraceful an object as may be found. The novel umbrella folder shown in the accompanying photograph does the work better and more quickly than it can be done by hand.

The folder is made of aluminum

Ornamental Umbrella Attachment, Serving to Roll Up the Umbrella Tightly and Much Better Than if Rolled by Hand

covered with leather upon which the owner's initial or monogram is stamped. The tube is held in one hand while with the other the umbrella is inserted, lower end first, after which it is slowly turned until the upper part of the "shower-stick" is reached. The folder is an English invention.

SHORT-CIRCUIT FIRES CAUSED BY BIRDS

Panic among a flock of starlings, brought about by the attack of a sparrow hawk, was the extraordinary cause of a series of fires breaking out simultaneously in Württemberg, Germany. The starlings flew blindly toward a transformer house and some of the birds became entangled between the

inductance spirals and the insulator pins. As a result the transformer-house tower was connected with a 10,000-volt line and, it is said, if the ground connection had been effective the rush of current would have been sufficient to open the main-station breakers. Unfortunately, only one ground plate had been provided and after an exceptionally dry period this was found to be in dry soil, hence the high-tension charge took the easiest way to earth which happened to be by way of various house installations. Immediately several fires resulted and in attempting to extinguish them with water a number of persons received violent shocks. None was seriously injured, however, and only one house suffered damage of consequence.

ELECTRIC BELLS WITHOUT BATTERIES

A batteryless electric doorbell, which was recently put on the market, makes use of a compactly designed magneto generator, which is operated through gearing from a small handle that replaces the ordinary push button.

The magneto generator is provided with an extension shaft, so that it can be installed on a door casing of any thickness, with only the handle, which has the appearance of an oblong door knob, and the escutcheon plate showing from the front. The generator itself may be mounted on the inside edge of the door jamb, it being very neat in appearance; or, if desired, it may be mortised in the brick or woodwork, the escutcheon plate being of ample size to cover the opening for it.

Wires are run from the generator to a bell, which may be located anywhere, with respect to the generator. The bell operates very easily, only a small part of a turn of the handle being required when it is desired to sound the signal.



MOTOR CAR FURNISHES POWER FOR PYLON BEAM



Grahame White's Night Flight in Aeroplane
Disclosed by Searchlight

A recent night flight in an aeroplane by Grahame White at Hendon, England, was made spectacular by the constant play of an electric searchlight on the machine. The sensational features of the flight are clearly brought out in the accompanying illustration. A few years ago such a picture would have had no place among the realities but likely would have been considered the imaginative feat of a Jules Verne or H. G. Wells. As there is no electric power at the Hendon aerodrome, the question of obtaining power to operate the searchlights presented a vexing problem, until one of the promoters of the event solved it by stripping the body from his motor car and running the dynamo by means of a belt from the engine flywheel.

DESTROYING RATS BY INOCULATION

The menace of the rat as a carrier of deadly diseases continues to receive the attention of scientists. The latest method of exterminating the rodents is by the use of a bacterial culture containing the germs of a disease to which only rats and mice are susceptible. The preparation attracts the vermin and they feed upon it voraciously with the result that they are quickly attacked by the fatal disease, which is then rapidly communicated to others.

TRANSPLANTED RUBBER TREES THRIVE

Experiments covering a number of years in transplanting rubber trees from the original stock seem now to have justified the efforts of the growers. The former supply came almost entirely from the district bordering the Amazon and its feeders but in recent years transplanting has been practiced on a rather large scale, the original stock having been taken from the old rubber districts and cultivated in portions of Brazil remote from the big river. One company, during the last year, gathered 193,750 lb. of rubber compared with 41,983 lb. in 1910. The estimate for the current year is 325,000 lb., all of which comes from the interior, far from the Amazon.

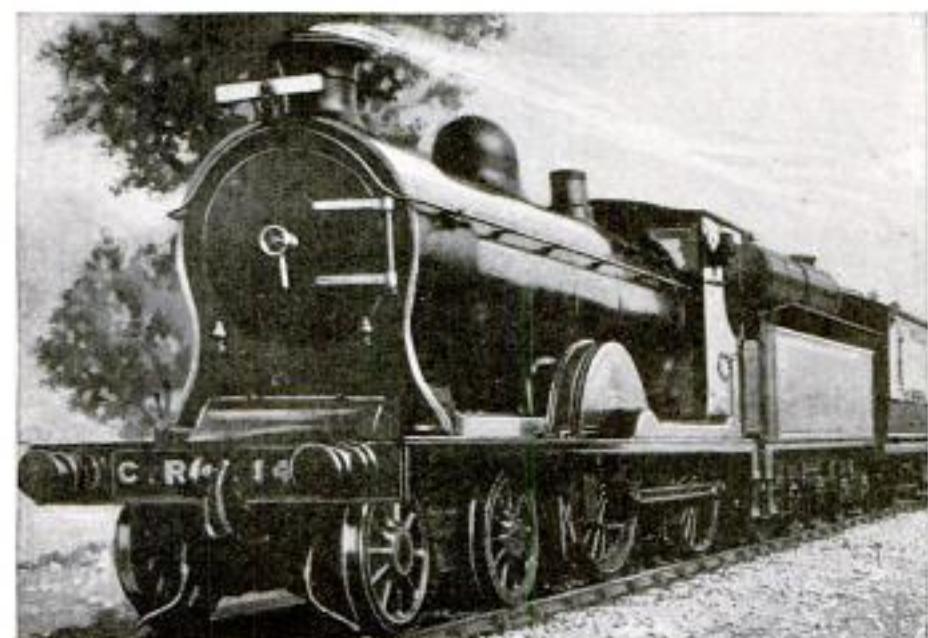
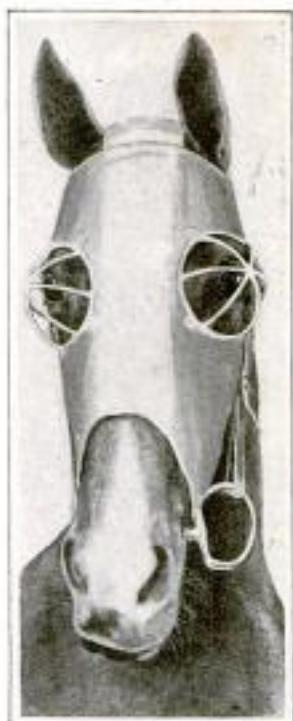
BRITISH OIL-FUEL LOCOMOTIVE

In the accompanying illustration is shown one of the great number of oil-burning locomotives at present in use on the Caledonian Railway, operating trains through England and Scotland.

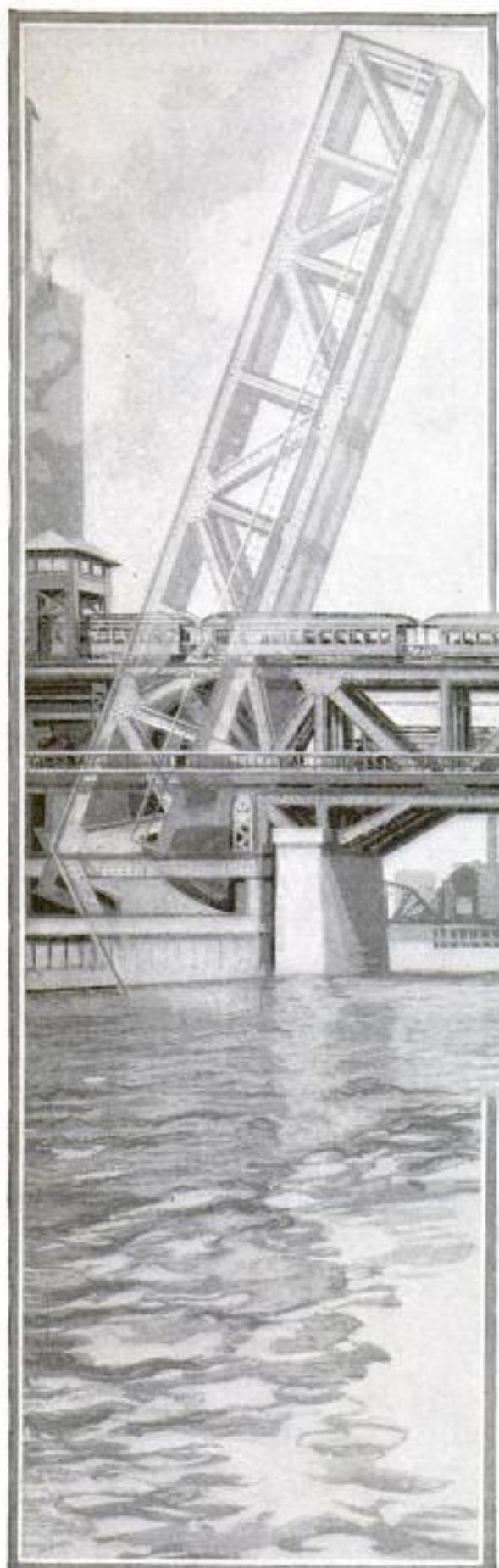
The oil is stored in a cylindrical tank carried on the tender where coal is ordinarily stored. The oil flows from the tank to the engine injectors which force it into the fire box at two separate points, where it mingle with steam from the boiler.

PROTECTS PONIES' EYES IN COAL MINE

A new law in England has been enacted to enforce humane treatment of the "pit ponies"—as the horses are called that are employed in coal mines. The new law has inspired the invention of the eye guard shown in the accompanying illustration. Before the law went into effect, many ponies became blind through injuries caused by projecting coal seams and rocks that protruded into the subterranean passages of mines, all previous efforts to protect them having failed.



New Type of Oil-Fuel Locomotive, Adopted by One of the Great British Railroads, the Fuel being Kept in a Cylindrical Tank on the Tender



DOUBLE-DECK BASCULE

Chicago's bridge and harbor engineer has put up to the contractors a brand new problem in the construction of a bascule bridge, the type of drawbridge where the main part of the bridge bends up like a jackknife. Here is the problem:

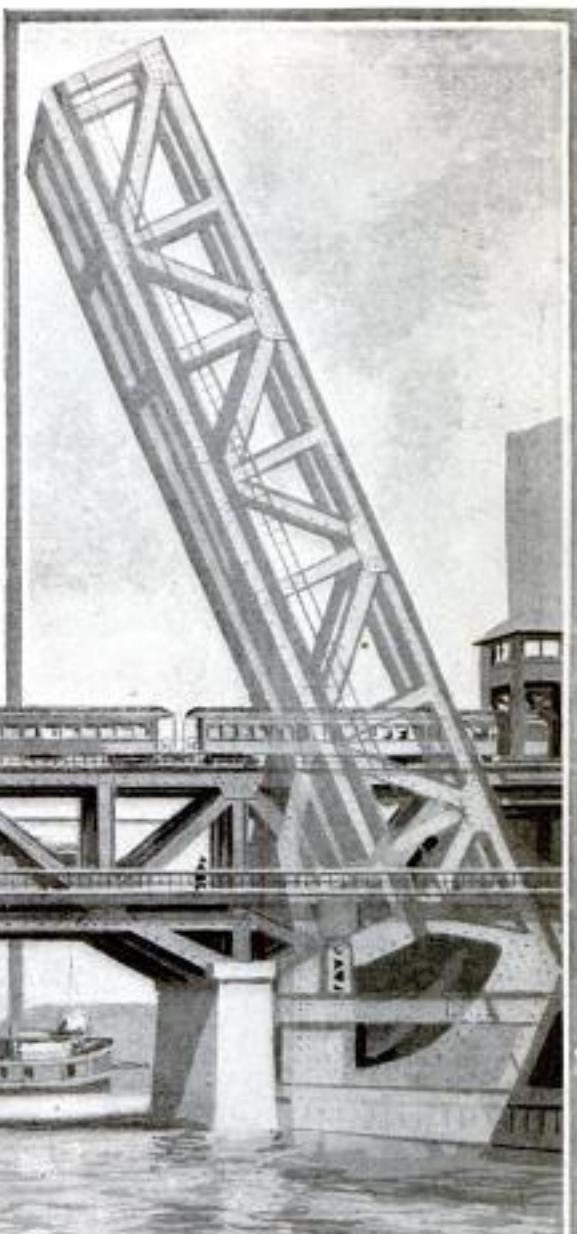
Give us bids on the construction of a two-deck bascule with a 200-ft. span and double-decked to accommodate an "L" line above, a street railway below, two wagon ways and two footwalks. Prepare to build it as rapidly as possible at the exact spot of the present swing bridge without interrupting the traffic on the "L," the surface lines, the streets, the river or in

the Illinois tunnel under the river. If the contractors should insist upon it, Engineer A. J. Hammond will let them stop traffic for four hours some night, but that is all. The bridge is to be built at Lake Street which is at the south end of the turning basin that connects the north and south branches of the Chicago River with the main stream. Traffic over the present Lake Street center-pier swing bridge, which the war department has condemned, is heavier than at any other bridge in Chicago excepting the Rush Street bridge. To tie up traffic for an hour means an immense loss.

BRIDGE FOR "L" TRAFFIC

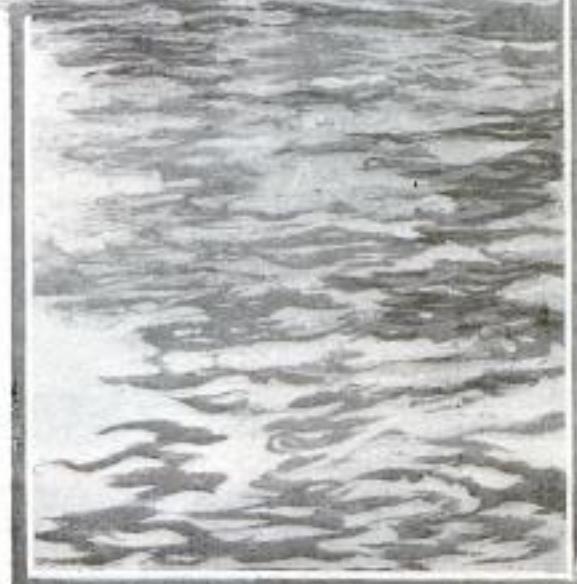
This is the first time in the history of Chicago,—and the city engineer says in the history of bridge building,—that an attempt has been made to erect a double-decked bascule for heavy traffic. Some idea of the tremendous strength required of the bridge may be obtained when it is understood that the structure must be capable of bearing the weight of two "L" trains, eight heavy street cars and all the tonnage of a continuous stream of teams and motor vans.

The engineering department will require the superstructure contractors to build the leaves of the bridge in the air, so that traffic on the surface,

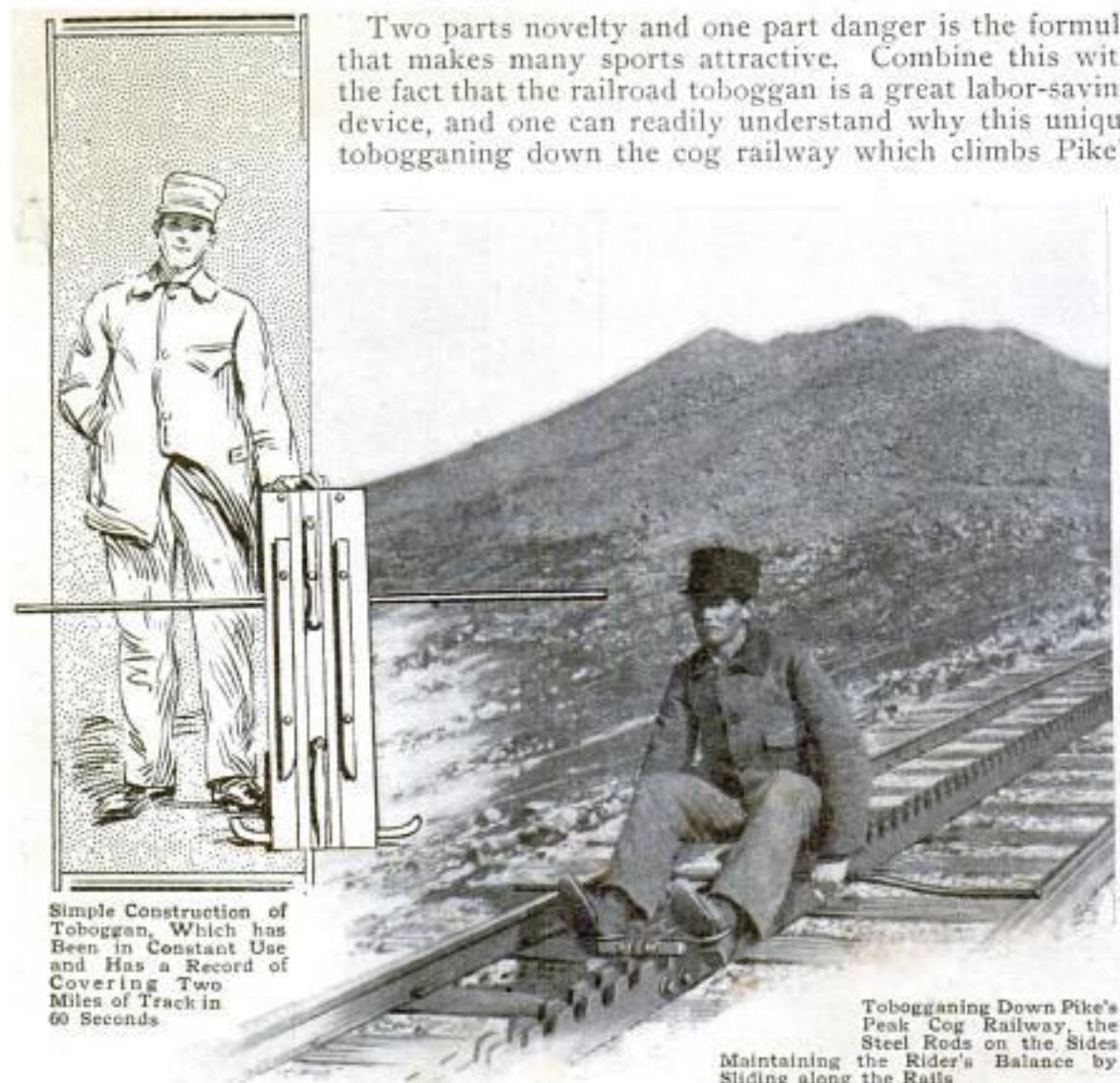


the river and the "L" deck may not be stopped. To do this successfully a few parts of each leaf will be left out to allow the passage of cars. When all the work is completed, except the placing of these omitted parts, two big scows will move under the old bridge. It will then be jacked up from its turntable and a tug will take it to the junk yard.

Immediately the leaves of the new bascule will be dropped into place and a crew will rush the final work of laying the roadbed and rails. This work will be done at night and is expected to take less than four hours.



RAILROAD TOBOGGANING ON PIKE'S PEAK



Simple Construction of
Toboggan, Which has
Been in Constant Use
and Has a Record of
Covering Two
Miles of Track in
60 Seconds

Tobogganing Down Pike's
Peak Cog Railway, the
Steel Rods on the Sides
Maintaining the Rider's Balance by
Sliding along the Rails

Peak, Colorado, is so fascinating. To make a drop of nearly a mile and a half in a distance of nine miles of track, sometimes at a speed of two miles a minute, is the reason why the railway toboggan has come into use, for the employes find it far more exhilarating to slide down the mountain than to go on foot. When a tired and hungry workman quits work at the summit at six o'clock and is due at the Saddle House, two and a fourth miles below, for supper, he usually prefers to "slide down the banister" rather than to "go down the stairs" from tie to tie in his descent. This practice has been responsible for sev-

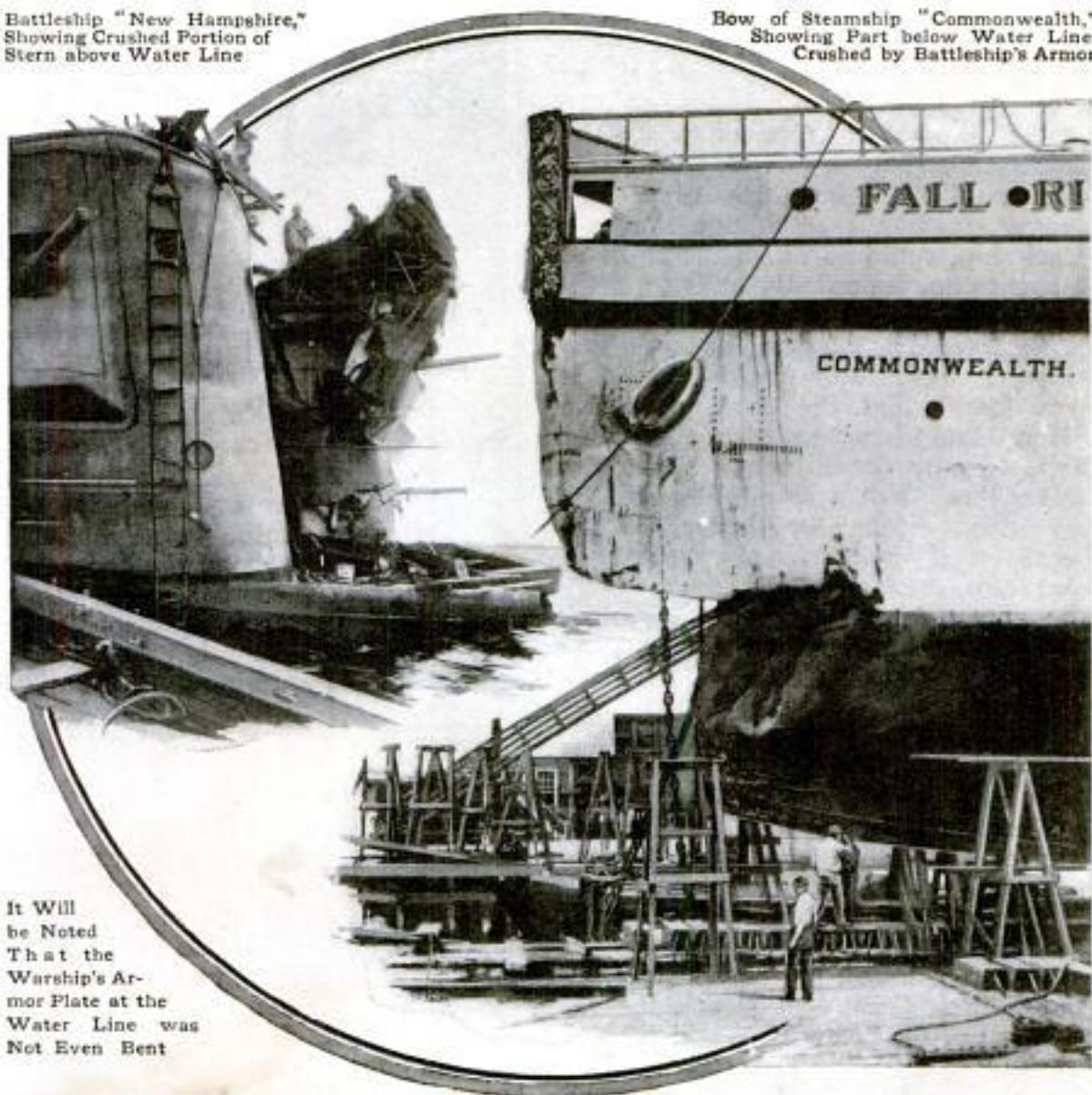
eral deaths and many serious injuries, yet it continues, although the authorities have attempted to discourage its use.

In riding the toboggan the operator sits upright, much as a boy would in guiding a bobsled, but there is no guiding to be done, for the machine is made to follow the tops of the cog rails. The toboggan itself is a board 3 ft. long and 1 ft. wide. A steel-shod cleat, about $1\frac{1}{2}$ in. wide, runs in the center of the under side for its entire length. When the machine is in place on the cogs this cleat fits in between the cog rails, which are parallel with each other and close together, midway

between the main rails of the track. Near each edge of the board is another cleat, about 18 in. long, also shod with iron, and movable. These form the brakes and are operated by a powerful lever from the upper side of the board, the pressure applied in this manner on the sides of the cog rails being sufficient to bring the toboggan to a stop on the steepest grade.

The Pike's Peak toboggans have established a record of an 11-minute run over the nine miles from the summit of the mountain to Manitou at its foot. A two-mile stretch on the steepest part of the grade has been made in one minute.

Battleship "New Hampshire,"
Showing Crushed Portion of
Stern above Water Line



It Will
be Noted
That the
Warship's Ar-
mor Plate at the
Water Line was
Not Even Bent

WARSHIP'S ARMOR PLATE STANDS COLLISION

The accompanying photographs show the unique results of the collision between the United States battleship "New Hampshire" and the Fall River steamship "Commonwealth," at Newport, R. I., in July. The conclusion drawn from these pictures which most interests naval constructors is that the armor belt of the battleships can withstand the most severe impacts.

The "New Hampshire" was lying at anchor in Newport harbor when the collision occurred. There was a dense

Bow of Steamship "Commonwealth,"
Showing Part below Water Line
Crushed by Battleship's Armor



fog, and before the lookouts on either ship discovered the proximity of the other, it was too late to avoid the crash. The passenger steamship plunged, bow on, into the stern of the "New Hampshire" almost on the center line of the ship.

When the vessels separated after the crash, apparently the "Commonwealth" had sustained no damage, while it was seen that the stern of the "New Hampshire" was almost demolished above the water line. The bow of the "Commonwealth" penetrated the stern of the battleship a distance of about 20 ft. The steel plating was folded in, decks torn up, and the captain's cabin was demolished.

Comparison of the effects of the collision upon the two ships, so far as the damage done to both was visible as they lay in the water, resulted at first in the severest criticism of the battleship's construction. Amazement was expressed that the prow of a passenger steamer, even though she be a steel ship, could so crush the stern of a battleship, supposedly built to withstand heavy shell fire.

Further examination of the two ships, however, turned the tables. It was found that the damage to the "New Hampshire" ended at the armor belt, two or three inches above the water line. Not a single plate of the armor was broken or displaced. The more vital portions of the ship's structure, then, remained intact. Only the upper works, the thin sheathing, which is designed merely to finish off the stern of the battleship and withstand the sea, was injured, and the damage, while it looked so serious, was in reality rather superficial. Not even the watertight bulkhead was broken through, so that the damage was confined to the sternmost compartment.

When the "Commonwealth" was docked, however, it was discovered that the portion of the bow, below the water line, which had struck the armor belt of the "New Hampshire," was fearfully mangled. The steamer was thus rendered unseaworthy to a much

greater extent than was the "New Hampshire."

"SHOO FLY" GUARD TO HELP SCREEN DOORS

An interesting device designed to keep the flies from entering the house or store when the screen is opened to let people in and out is here shown.



Attached to the top of the door and extending a foot or two down its outer side is a screen attached to metal supports which are bent or curved outward. To the bottom of a portion of this screen are attached a number of cloth bands. One of the illustrations shows the guard in the position it occupies when the door is closed.

When the door is pushed or pulled open the top of the guard screen is restrained sufficiently by a checking attachment to make the lower end, with its tasseled strip of cloth, swing outward about 2 ft. in advance of the door, thus dispersing the flies that might otherwise enter. The screen portion of the guard above the door is calculated to keep flies from entering over the door.

CATCHING GRASSHOPPERS IN VACUUM CLEANER

Catching grasshoppers with a vacuum cleaner is an idea worked out successfully by a California man. He found that grasshoppers from the alfalfa were a serious pest in the house gardens, so he rigged up a sled for the vacuum cleaner, and proceeded to capture the insects from the fields. The hoppers jumped as the sled approached, but were then sucked up by the cleaner.

RAPID-FIRE GUNS FOR AEROPLANES

No branch of the science of aviation is receiving closer study in army circles than that tending to the development of armaments for aeroplanes. New ideas in rapid-fire guns, or adaptations of the old, are being experimented with by the military experts of all the great powers; and of the guns now creating interest an American gun is one of the most important.

The gun in question is a new type of automatic, invented by Lieut.-Col. I. N. Lewis, of the coast artillery corps, who has designed many useful military implements. One of the important features of this gun, which may be held to the shoulder like an ordinary rifle when being used to attack aerial fighters from the ground, is the automatic device by which the barrel is kept continually cool by



New Rapid-Fire Gun
Tested by Army
Aviation Corps for
the Two Uses of
Firing at Aero-
planes from the
Ground and Firing
from Aeroplanes

a blast of air. After a certain temperature is reached, an increased rapidity of fire tends to reduce the temperature. Another distinguishing feature is the circular magazine feed, which is placed directly over the center of the gun, and consequently does not disturb the aim.

The weight of the gun is but slightly more than 25 lb.; it fires 250 shots per minute, and the magazine, which contains 50 rounds of ammunition, can be quickly detached to allow the substitution of a loaded magazine. The feed is positive, and the gun may be fired at any angle, up or down.

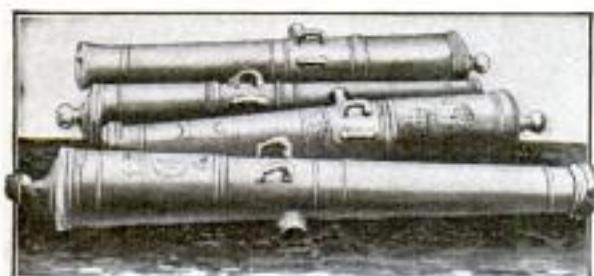
During one of the experiments made by Captain Chandler, the empty shells ejected during the firing were caught by a current of wind that carried them into the propellers. When the machine came down, the wooden propellers were found to have been scored or gouged as if a vandal had attacked them with a chisel.

The French have adapted a Hotchkiss rapid-fire rifle for attachment to the under framework of an aeroplane where it may be trained on the enemy below.



ANCIENT BRONZE GUNS USED IN ENGINE MANUFACTURE

One of the interesting things that a writer in the *Engineer*, London, found in the course of a visit to the Diesel



Ancient Bronze Cannon Bought Up to Provide Bronze for Diesel Engines

engine plant in Turin, Italy, was a collection of ancient bronze cannon which had been bought up to be melted and converted into crank casings and bedplates. One of the guns seen was a

beautiful piece of work, dated 1717, and had the name of King Philip V of Spain on the breech. It was worthy, the writer believes, of a better fate.

"LOOK-OUT-FOR-THE-CAR" SANITARY CUPS

The necessity of providing its passengers with sanitary drinking cups has been utilized by the Beaver Valley Traction Company of New Brighton, Pa., as a means of impressing them with accident-preventing "don'ts."

On the sides of the paper sanitary drinking cups is printed such advice as "Stop—Look—Listen," "Look out for automobiles and cars from opposite direction," "Never step on or off a car while in motion," "Don't allow children to play in streets on which electric cars run."

HYDROELECTRIC POWER ON A FARM

Electricity is becoming more and more a desirable prime mover on the farm, and one of the most interesting



Views of the Reinforced Concrete Dam and Reservoir of the Hydroelectric Installation on Henry Ford's Farm near Detroit

recent installations in the United States is the hydroelectric plant in operation on Henry Ford's farm, near Detroit. It represents what might be termed the height of development in the utilization of small water power in the operation of a private plant, the power being provided by the damming

of a small stream running through the farm.

The reinforced concrete dam is about 100 ft. in length and gives an 8-ft. head of water for operating two small water turbines. These turbines drive two

vertical-type, 35-kw., 250-volt generators. There are six circuits leading from the powerhouse to various buildings and parts of the farm, and five



of these circuits are laid underground. The longest circuit is 2½ miles, and

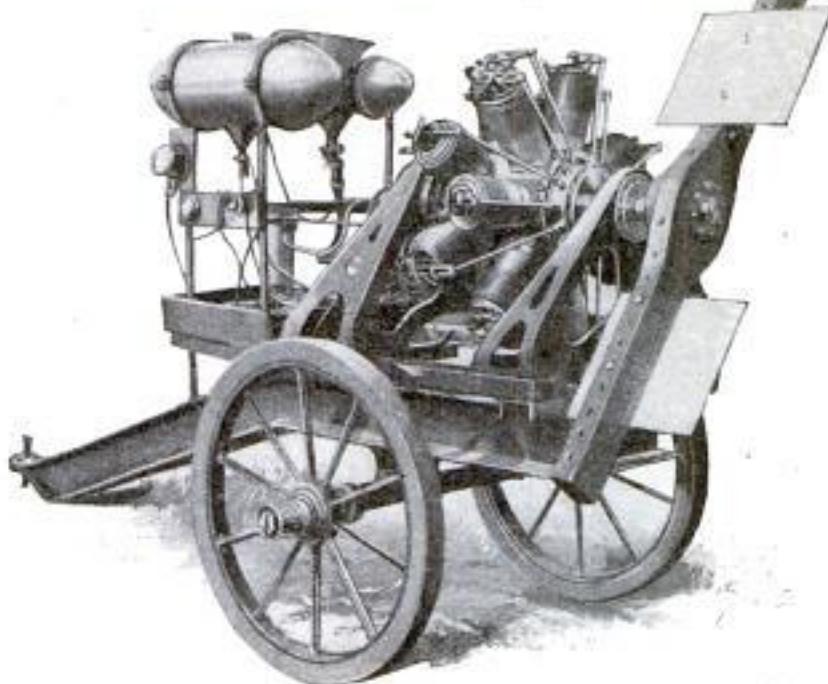
operates the machinery of the dairy farm. The house and barns are all electrically lighted, there being 60 incandescent lamps in the barns and 14 in the house. Another circuit is a mile long, and operates the machinery of the stock farm as well as illuminating the cattle and horse barns. The other lines operate the machinery in the repair house, the pump house, etc., and illuminate and provide power for numerous cooking, heating and household utensils in Mr. Ford's summer home.



The Circular Steel Blocks, Weighing 81 Lb., Used in the Making of the Cylinder of the Gnome Motor

THE MAKING OF GNOME MOTORS

The Gnome motor with its revolving cylinders, is probably the most famous and most universally used of all aeroplane motors, particularly in Europe. In one of the illustrations may be seen one of the circular steel blocks used in the making of the cylinders. They are of nickel steel, and weigh 81 lb. each. In the boring and the finishing, these cylinders are reduced in weight from 81 lb. to only 6.16 lb. The interiors of the cylinders are polished by high-speed emery wheels until they are as smooth as the surface of a mirror.



A Finished Motor Mounted on the Test Car Preparatory to a Long Duration Run

A MEASURING DEVICE FOR X-RAYS

A scientist of Berne recently demonstrated before the Röntgen Congress in Berlin an instrument for measuring the action of the X-ray on deep-seated organs. The device gives direct readings of the intensity of the rays at the depth required, and can be used with any type of X-ray installation.

The introduction of an absolute scale of measurement in place of

the arbitrary scales used in different X-ray laboratories is said to be a great boon, as it makes it possible to calculate the most efficient irradiation, and determine the correct dose for treating subcutaneous organs. It is claimed that this has hitherto only been possible when surface tissues have been treated.

During the first five months of the present year there were 85,300 motor vehicles registered in the state of New York, of which number 76,164 are pleasure cars and 7,320 commercial vehicles, the remainder being dealers' cars, or exempt from taxation.



An Exceptionally Light and Graceful Bridge Crossing the River Vilaine, France

SANDSTONE KNOB AS BAND-STAND FOUNDATION

A novel use has been found for one of the water and weather-worn sandstone formations so common along the shores of the upper peninsula of Michigan. The knob in question is located at St. Ignace, and on its top the band



A Bandstand on the Top of a Sandstone Knob at St. Ignace, on the Straits of Mackinac, Michigan

organization of that upper peninsula town has erected a bandstand. The stand commands a fine view of the straits and Mackinac Island.

AN ARTISTIC FRENCH HIGHWAY BRIDGE

The national highways of France are kept as fine as the best examples of city boulevards in America, and the bridges are usually in keeping with the roads. The new bridge across the River Vilaine, on the highway connecting the cities of Nantes and Brest, Brittany, is an excellent example, being extremely light and graceful in appearance.

The length of the bridge proper is 656 ft., the free span being reduced by the cantilever arches to about 367 ft. The height of the roadway above the river, at normal level, is 114 ft.

U. S. GOVERNMENT LARGEST DREDGING CONCERN

Attention is drawn by the Engineering News to the fact that the United States government is the largest dredging concern in the world, having a vast dredging fleet engaged in river and harbor improvement work. The fleet consists of 61 bucket and dipper dredges, 53 hydraulic pipe-line dredges, 23 seagoing hopper dredges, 60 snag boats, 164 screw-propeller and paddle-wheel boats for towing and survey work, 54 derrick boats, 49 pile drivers, and numerous other boats which bring the total up to 855 vessels.

MOTION-PICTURE RECORDS OF RECLAMATION WORK

As part of the movement to give publicity through motion pictures to all important works carried on by the government, a series of pictures have been recently made of the work on the Engle Dam, at Elephant Butte, New Mexico, which is part of the Rio Grande reclamation project.

Of all the motion pictures taken, probably the most interesting are the series photographed from a basket suspended from a cableway across the Rio Grande. The operator, with his camera in operation, was lowered into the foundation pit at the west bank of the river, and then, with the basket raised 400 ft. above the bottom of the pit, took pictures while three heavy blasts were fired. The basket was then moved over the river and lowered almost to the surface of the water, during which descent, the camera was turned through a complete circle so that the views would take in the entire work. The pictures will be exhibited generally in America and Europe.

CThe Post Office Department is conducting a series of experiments in various parts of the country to determine whether or not the motorcycle can be used more economically for collecting mail than either the horse-drawn vehicle or the automobile.

COMPACT LUNCHEON SET FOR MOTORISTS

One of the most elaborate luncheon sets for motorists now on the market is the so-called motor restaurant, a

Luncheon Chest for
Motorists Which
Opens Up as a
Table



complete outfit which packs compactly in the form of a chest for transportation in the car. The outfit costs \$125 or \$150, depending upon whether it is fitted for four or six persons. When the spot for the luncheon is reached, the chest is taken from the car, opened up and made into a table, as shown in the illustration. Across the top in the center is a rack, on which glasses, cups, etc., may be placed within easy reach of the users.

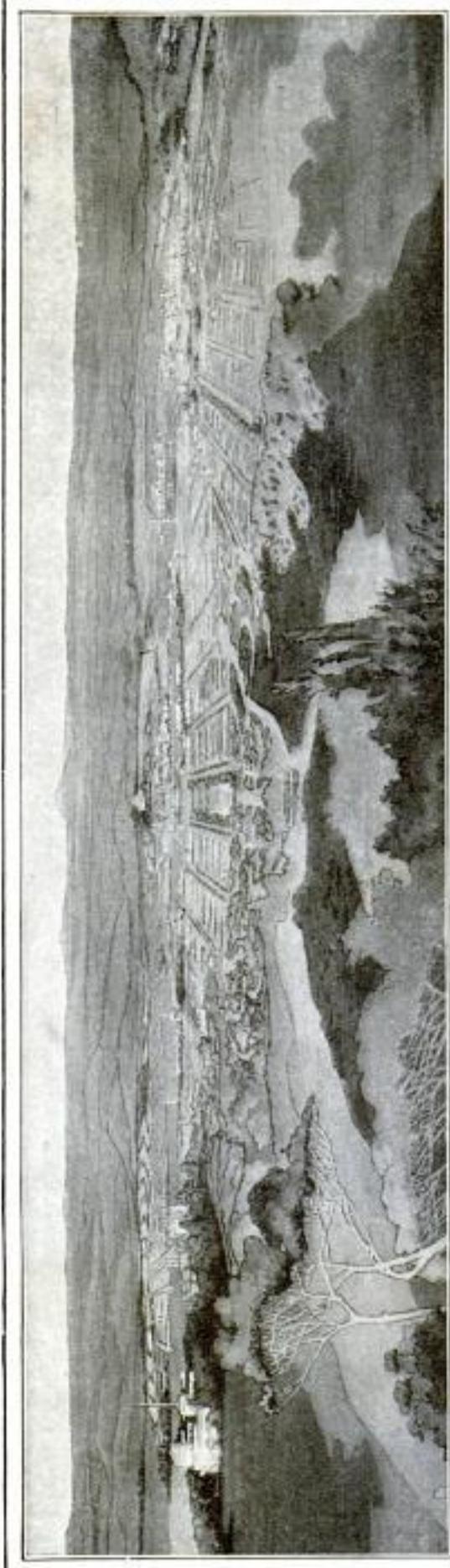
CREATING A CAPITAL

In a picturesque mountain valley 2,000 ft. above sea level and now practically a wilderness, a new capital city for the Commonwealth of Australia is to be created. As the result of a competition in which more than a hundred of the leading architects and landscape gardeners of the world competed, this city is to be built in accordance with the plans of an American architect, Walter Burley Griffin, of Chicago, who was awarded a prize of £1,750, equivalent to about \$8,500. The site of the new city is midway between Melbourne and Sydney and 75 miles from the sea coast, and work is to begin immediately.

The plan embodies the most advanced theories in city planning. The different functions of the city are grouped at specific centers, each arranged roughly in the form of an octagon, with main avenues radiating in all directions. Such a theory has never before been worked out in complete form, although Haussmann applied it in a limited way in the rebuilding of Paris, and L'Enfant, in his plan of Washington, provided diagonal avenues intersecting a checkerboard system of streets.

The practice of walking from point to point is rapidly becoming obsolete with city dwellers and there is an increasing tendency to use means of rapid transit. For this reason the different centers in the Australian capital have been placed at considerable distances apart. In a capital city the federal center is the one of first importance. This center comprises the octagon and triangular group of buildings south of the central lagoon. At the center of the octagon, occupying a prominent elevation, are the federal executive buildings. On the sloping ground extending to the lagoon, and arranged in terraces, are the parliament and department buildings, and courts of justice. On the opposite side of the lagoon are the stadium, museum, theaters, and other places of amusement.

North of the federal center, and across the lagoon from it, is the mu-



Australia's New Capital City from Mount Ainslie, the Capitol Building being in the Center

CITY FOR AUSTRALIA

nicipal center, the one next in importance. At the center occupying the third angle of this triangle are located the central railway station and retail market. The manufacturing district lies at the northern edge of the city, and the agricultural suburb, consisting of several centers, at the southeast. The principal residence district is west of the federal center, on high ground affording an unobstructed view of the mountain range to the southwest. The federal university is located to the west of the municipal center on the slope of a mountain.

Main avenues are planned for a width of 200 ft., divided by parkways into three arteries of travel: one for street cars, one for automobiles, and the third for slower vehicles. The steam railway is to be depressed below street level with street crossings carried on viaducts.

A striking feature of the plan is the advantage taken of the natural conditions of the site. A small stream known as the Molonglo River is used in the development of a series of lagoons that form the central feature in the general architectural effect. Prominent elevations, of which there are a number, will be utilized as sites for public and monumental buildings. Mountain peaks will close the vista of each important avenue, while Mount Bimberi, one of the highest peaks of the Australian range, will be visible from all parts of the city.

PLAYER PIANO USED WITH LONDON ORCHESTRA

A recent concert of the famous London Orchestra, conducted by Nikisch, was unique in that it was the first time, in England at least, that a mechanically played piano was used as part of a great symphony orchestra. The pianoforte part of Grieg's Concerto in A Minor and in Liszt's Hungarian Fantasia is said to have been performed by the player piano with perfect effect.



NEW AUTOMOBILE CAP AND GOGGLES

Among recent importations of wearing apparel for motorists are the goggles and cap shown in the accompanying illustrations. The cap is adjust-



Goggles with Adjustable Awning-Like Eye Shades



A Cap Which may be Adjusted to Fit Any Head

able to heads of different sizes by means of the cloth strap which passes around its rim and is provided with a buckle. The goggles have awning-like eye shades which can be folded back when not needed.

Contrary to general practice in testing submarines at great depths, the new U. S. submarine "Carp" was recently sunk to a depth of 200 ft. at San

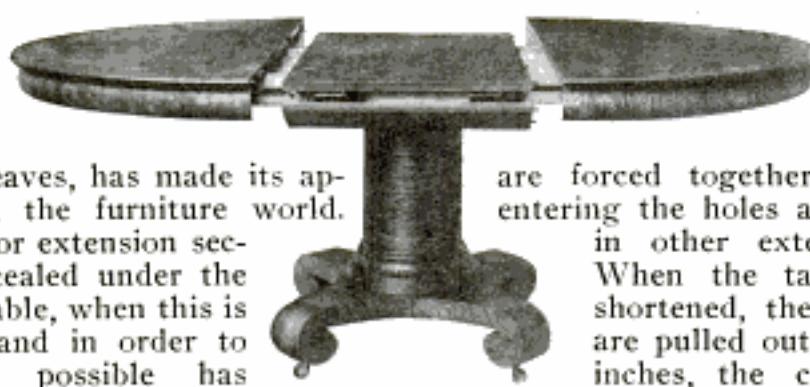
Francisco with a crew of eight men on board, and an accident which might have ended disastrously kept the little vessel at the bottom for over an hour. The trouble was due to fouling of the hawser pipe of the submarine by an anchor chain, which for a time prevented a return to the surface. During the time the submarine was thus caught telephone

communication was maintained with the officers in charge of the test at the surface.

The service of the crew was voluntary, and a considerable bonus was offered.

NEW IDEA IN EXTENSION TABLES

A dining-room table which is, in appearance, like an ordinary extension table, but which may be extended without the use of any loose leaves, has made its appearance in the furniture world. The center or extension section is concealed under the top of the table, when this is closed up, and in order to make this possible has hinged portions at its shorter ends, which normally hang down. When extending the table, its end sections are drawn apart and the center section by means of a lever raised about $1\frac{1}{4}$ in. to the level of the top.



Extension Dining Table, the Central Portion of Which, Operated by a Lever, Can be Lowered so That the End Sections Slide Together over It

The hinged portions at each side are then raised so as to make the center section the full width of the table, and the sections

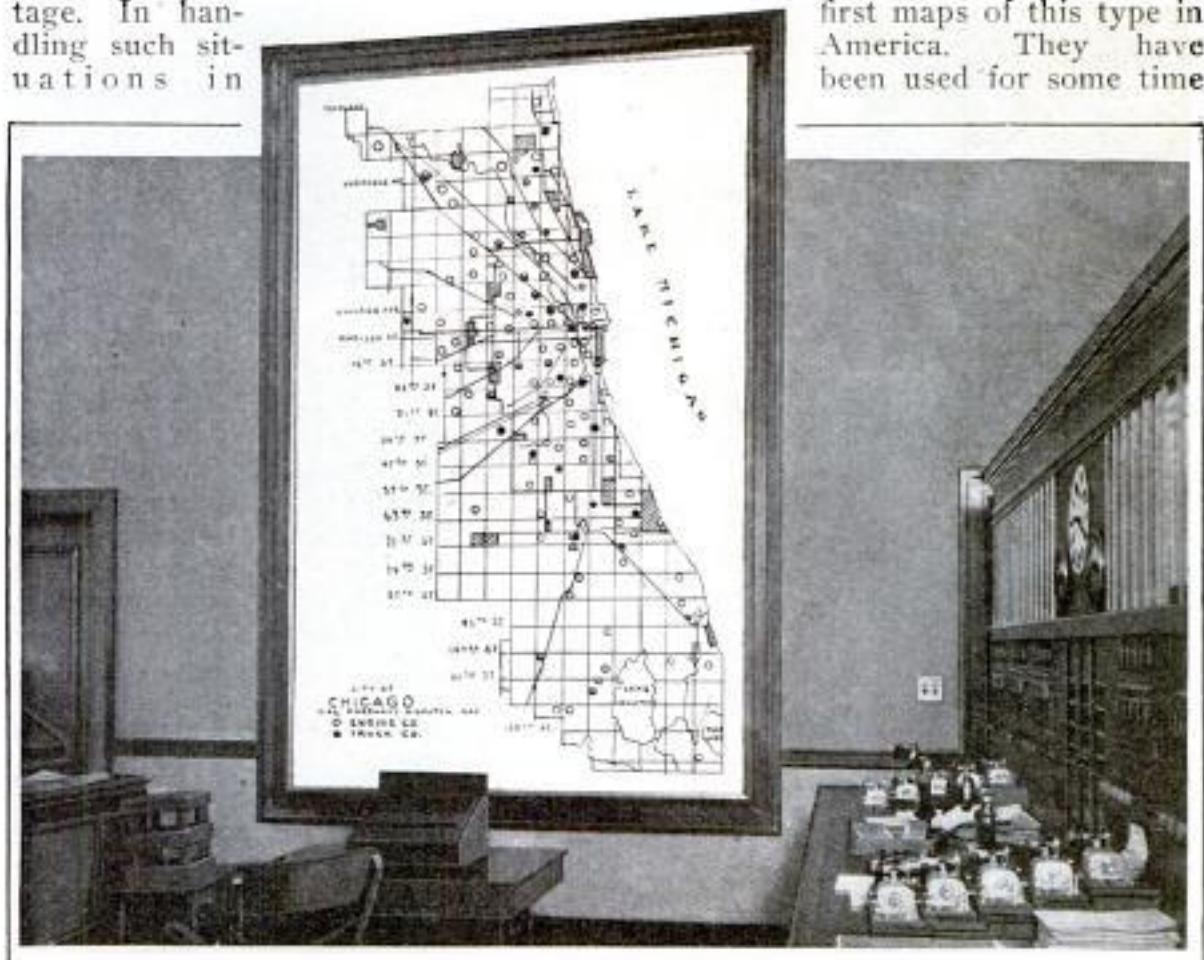
are forced together, the dowels entering the holes and locking as in other extension tables.

When the table is to be shortened, the end sections are pulled out two or three inches, the center section lowered the required $1\frac{1}{4}$ in., and the hinged side portions dropped. Then the end sections are pushed together over the center section. No hint of its unusual mechanism is seen in the closed table.

FIRE-STATION MAP SHOWS UNPROTECTED TERRITORY

When a big fire occurs in any section of a large city, all the fire apparatus in that section, and often from adjacent sections, are called into service, and frequently this causes considerable difficulty in distributing the remaining companies and apparatus to the best advantage. In handling such situations in

By means of this system, a glance at the map suffices to show the unprotected territory, and the fire apparatus not in actual use are distributed accordingly. The illustration shows the map in the position it occupies on the wall of the fire-alarm headquarters. This is one of the first maps of this type in America. They have been used for some time



The Illuminated Fire-Station Map in the Fire-Alarm Headquarters of the Chicago Fire Department

Chicago, the fire-alarm headquarters in the city hall is provided with a map of the city on which each fire house is designated by a small electric-light bulb, operated by a switchboard. These bulbs are illuminated during the time the apparatus of each fire station is in its house, but as soon as the apparatus leaves its house, a plug bearing the number of the station in question is removed from the switchboard and the bulb designating this station on the map becomes dark.

in Germany. Milwaukee has a fire map of a somewhat similar type.

An American sailing vessel, the "Erskine M. Phelps," made a voyage from Honolulu to Philadelphia in 110 days, and she has to her credit also a voyage from Norfolk to Honolulu in 97 days, the fastest time ever made around Cape Horn by a sailing ship. Her latest voyage is the fastest time ever made by a sailing ship on the eastern voyage.

NEWEST WAY OF WEARING A BOUQUET

One of the latest fads in flower adornment is to wear the bouquet on



The Shoulder Bouquet, with an Accompanying Initial Worked in White Silk Cord

the right arm at the shoulder. It is placed on the sleeve in conjunction with a neat little initial worked with white silk cord. The effect is most pleasing, and, to the girl endowed with artistic fingers, many pretty arrangements or variations will suggest themselves.

ARTIST AND SCIENTIST TRY NIGHT PAINTING

How to obtain satisfactory light for portrait painting at night is being studied scientifically by a young Chicago artist, Mosheim Craig, with the advice and assistance of one of the

leading scientists of the country. The scientist became interested in painting, using Mr. Craig's studio, and as he had little time for this avocation except evenings, the problem of illumination was forced on him. The two have worked together for a solution, to some extent covering the same experimentation ground as the investigators who have been seeking artificial daylight for use in stores.

The artist claims that there is a certain aesthetic value to painting done at night. But when he tried to mix oil paints by artificial light, he found that the color values were lost and that the work when viewed the next morning was practically worthless. The youthful collaborator with the scientist sought a light which would "take the yellow" out of the rays from a tungsten cluster. The first effort was very nearly a success. A large tank was built. A 500-watt tungsten lamp was placed in the rear of it. The reflectors threw this light forward through two pieces of plate glass. The secret of the light lay in the substance, between these pieces of glass. It was clear water tinged to a violet color with an aniline dye. This accomplished the purpose of producing the colors of daylight. But the experiment failed for one very simple reason; after the light had sifted through the colored water it was too weak to reach the painter's easel and his palette.

For a time Craig tried to produce the same result by wearing automobile goggles of blue glass. He sought a violet-tinted glass, but no optician could supply it. With the blue glasses he painted two portraits, one of Judge Kenesaw Mountain Landis, but when he exposed these to daylight he found that they were "too gray." The colors lacked brilliancy.

The scientist has now suggested that the problem can be solved by securing from Germany a certain violet-tinted gelatine film, colored under the artist's personal direction. This will be placed in the light box in lieu of the water tank and the tinted water—which, by the way, had a habit of steaming. Both

experimenters believe they will then have found the answer to their riddle. Should this also fail, they have other plans which are not being discussed at this time.

The experiments have already proved of value in a mechanical way. The light blue glasses for example gave a sufficiently accurate color value for matching of cloths and for the use of decorators who work at night under the ordinary incandescent lamp. If such a glass is used on the stage or in a department store over a brilliant yellow lamp the result to the ordinary observer is artificial daylight. The woman who bought a costly delicately tinted gown under such conditions, however, might be disappointed when she looked at it in daylight.

ARTIFICIAL SILK MADE FROM VEGETABLE

In Muskegon, Mich., is a knitting mill which manufactures artificial silk out of vegetable fiber, and uses it to make hosiery and underwear. The artificial product is soft and silky like worm silk, but is claimed to have more body or firmness.

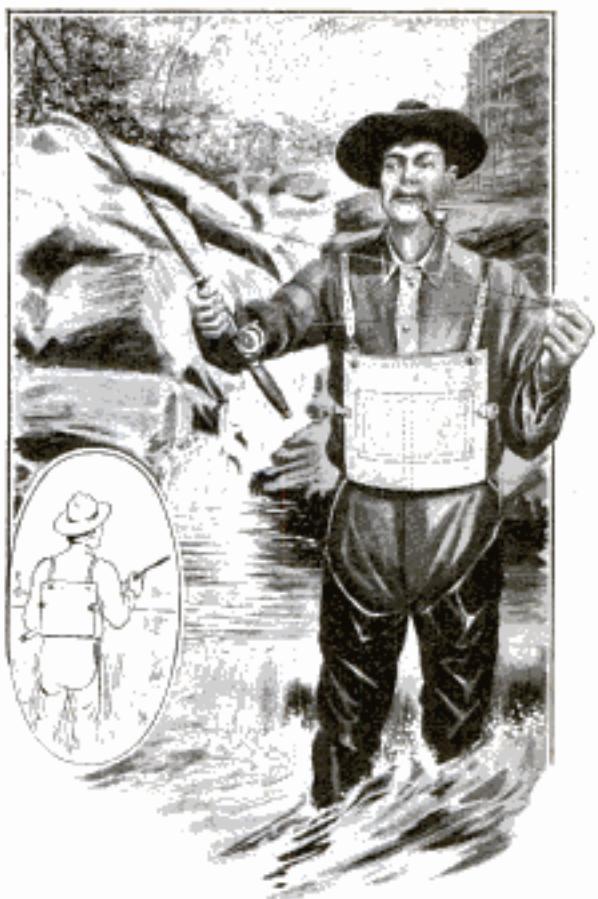
The underwear and hosiery are made in all weights from gauze to winter wear. The vegetable silk fiber is brought to the knitting room on large reels, ready to be put on the electrically operated machines when needed.

The basis of most artificial silk is wood pulp. Cotton has proved satisfactory for the purpose, however, although the cost has been a serious drawback. The vegetable silk is the latest innovation. Any substance susceptible of chemical conversion into cellulose is available.

POUCH ARRANGEMENT FOR ANGLERS AND HUNTERS

A Missouri sporting goods concern is marketing a high and dry pouch and harness for anglers and hunters. It consists of two large pouches, one in front and the other in back, strapped

over the shoulders and around the chest. On the outer surface of the front pouch are two small pockets for



Pouch for Anglers and Hunters Arranged for Carrying Tackle and Ammunition Well above Water

carrying small fishing or hunting accessories, such as flybooks, and the like. The position of the pouches is well above the waist line, so that they remain dry even during deep wading.

RUSSIA TO SPEND VAST SUM ON NAVY

The Russian Duma has voted the enormous sum of \$619,200,000 to be used during the next five years to restore the naval position of that country. About \$57,960,000 is to be spent in construction in 1913, \$48,000,000 per year for the years 1914-15-16, and \$43,200,000 in 1917. In addition to this, the Minister of Marine requires \$374,000,000 for the completion of ships now building and for current expenses.

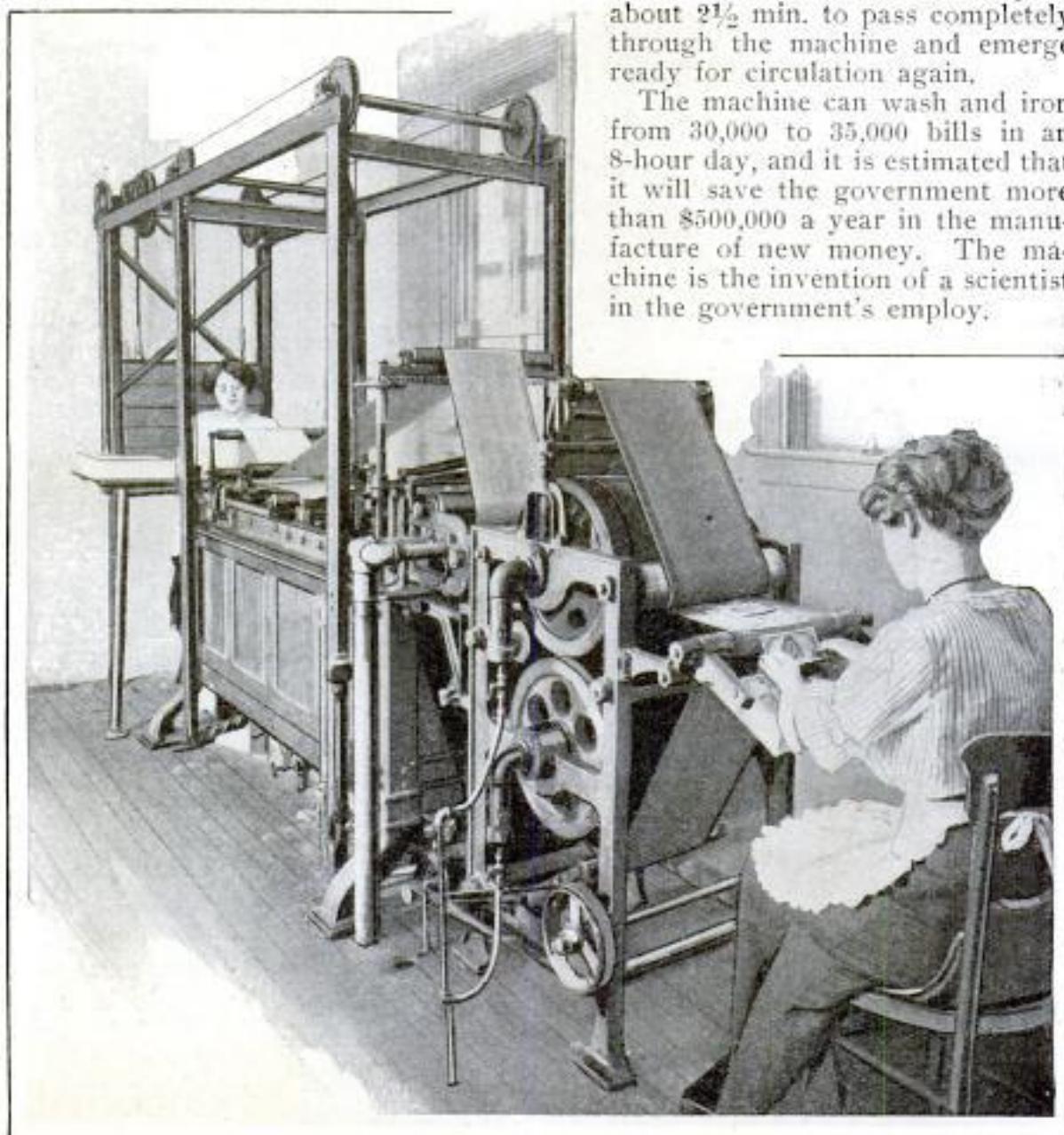
U. S. TREASURY INSTALLS NEW MONEY LAUNDRY

After experiments covering a period of three years the Treasury Department has set up a money laundry that will wash and iron old bills, making them almost as good as new. It is estimated that about 60 per cent of the bills sent to the department can be saved by this machine, the 40 per cent remaining being so worn that the treatment would destroy them.

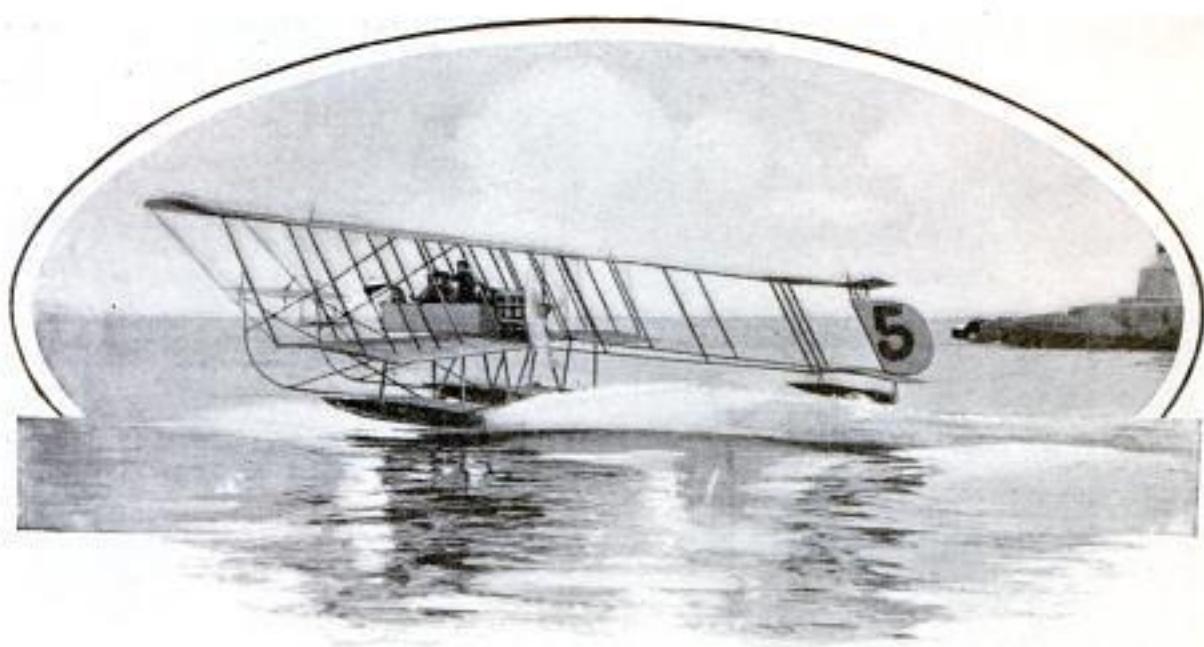
The bills, fed to the machine by a

young woman operator, are carried between two 10-in. tapes into a tank of boiling water, and then through a solution which, when heated to the boiling point, forms peroxide of hydrogen. This destroys the germs that may have collected on the bills while in circulation. The bills pass from the disinfecting tank to a rinsing tank, and thence to a pair of large gas-heated cylinders, the passage between which smoothes out all wrinkles. The bills require about $2\frac{1}{2}$ min. to pass completely through the machine and emerge ready for circulation again.

The machine can wash and iron from 30,000 to 35,000 bills in an 8-hour day, and it is estimated that it will save the government more than \$500,000 a year in the manufacture of new money. The machine is the invention of a scientist in the government's employ.



The U. S. Treasury's Money Laundry in Operation. The Endless Band may be Raised to Top of Frame to Permit Examination of Money Passing Through



Hydro-Aeroplane at Monaco Carrying a Paying Passenger Who Desired to Enjoy Aeroplane Flight without Much Danger

THE HYDRO-AEROPLANE FOR PASSENGER CARRYING

The recent hydro-aeroplane competition at Monaco, while it did not bring forth anything especially novel in the way of new constructions, and resulted in no important records, was very interesting because of the large number of passengers carried by the different machines without a single accident.

In fact, so absolutely reliable did the combined air and water vehicle prove itself on this occasion, that it seems certain that a most profitable application of flight engineering in the very near future may be passenger carrying by hydro-aeroplanes at amusement parks, summer resorts, etc.

Running in to Shore
at Monaco after
Trial Flight, to
Pick up Paying
Passenger

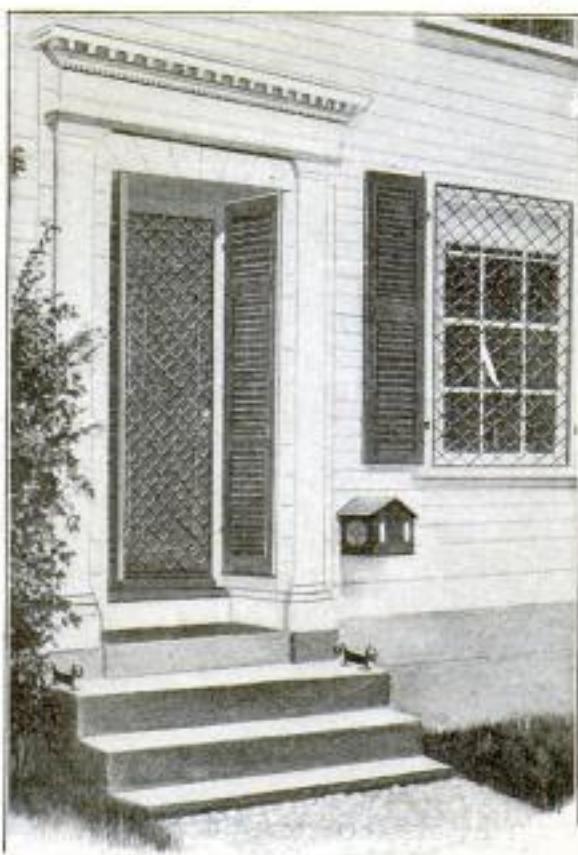
Water surfaces being comparatively soft and safe to alight upon, and so level and unobstructed that there is no occasion for attempting flight over them at any considerable height, the possibility of a serious accident with a well-built and competently piloted machine, and with the passengers perhaps protected by life preservers, seems so remote as to scarcely demand consideration by even the most timid.

FLEXIBLE WIRE SCREEN AS WINDOW PROTECTION

Instead of barricading the show windows with wooden or corrugated-iron shutters at night, several of the large retail stores in Berlin have lately



adopted a flexible large-mesh screen made of 0.4 to 0.6-in. iron wire, which, while affording an effective burglar



Flexible Wire Screen Placed Inside Window and Door Casings, so as to Obtain Protection while Windows and Doors are Open

protection, permits the window displays to be viewed. The screen shutters are raised, lowered, and locked in place from the inside.

The same type of screen shutter is also claimed to have many advantages which make it desirable for use on country houses in more or less lonely districts. By its use, windows and doors may be barricaded against intrusion and still remain open to allow the entrance of fresh air.

DISTINCTIVE COLORING FOR INDUSTRIAL-PLANT PIPES

It is proposed in Germany to develop a uniform system of distinctive coloring for the piping in industrial plants, and the idea is being received with favor. According to the system, the pipes carrying water would be

painted green; the gas pipes, yellow; air pipes, blue; steam pipes, white; oil pipes, brown; pipes carrying tar mixtures, black, and pipes carrying acids would be distinguished by being painted rose with red stripes.

A fuller indication of the contents of the pipes, indicating dangerous pressures, temperatures, impurities, etc., may be effected by a combination of the basic colors, such for instance as stripes of red for danger, black for impurity, white for presence of steam, or some such manner.

BEHAVIOR OF METAL TUBES UNDER COMPRESSION

The behavior of metal tubes under compression has been the subject of interesting experiments by a French scientist, who has made tests with metal cylinders as tiny as 0.023 in. in diameter, 0.027 in. high and with walls only 0.00004 in. thick. These little tubes were submitted to compression in a hydraulic press, the piston of which moved at a constant slow rate of speed. The gradual changes in the shape of the tubes were photographed by a motion-picture camera. The illustrations here shown are greatly enlarged.

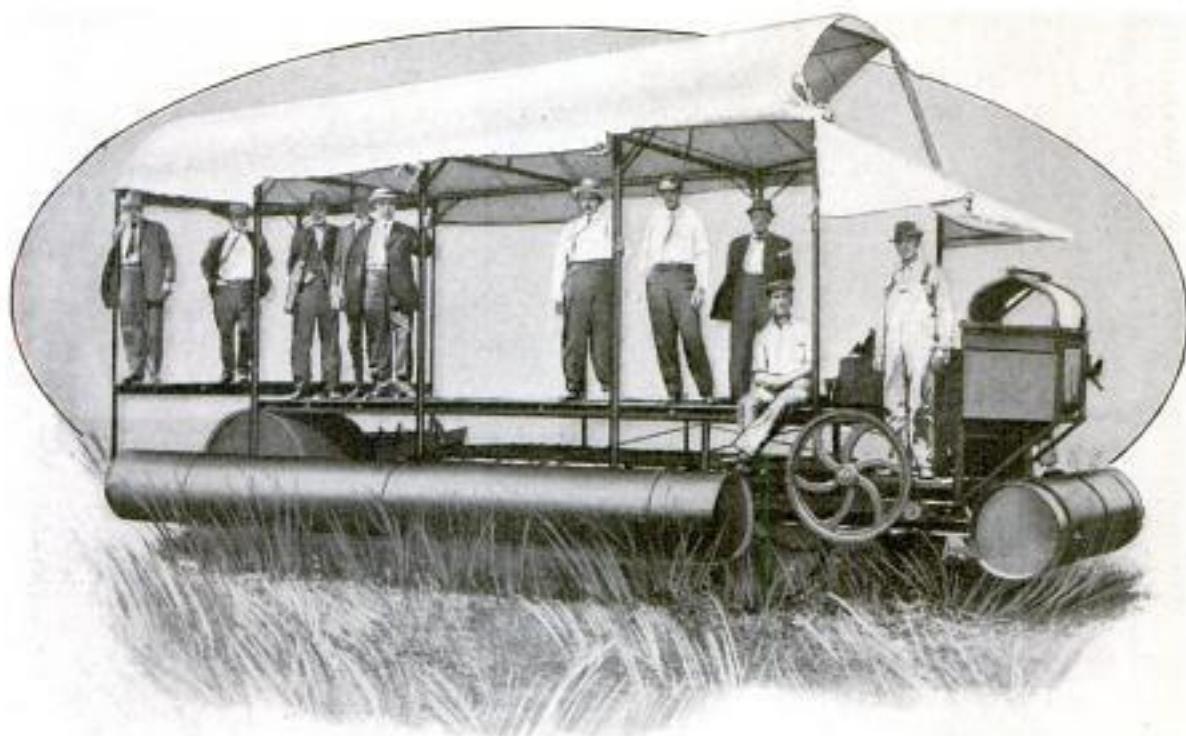
The experiments demonstrated a remarkable regularity in the folds or corrugations resulting from the compression. These corrugations, while varying with the diameter of the tube, the thickness of the walls and the nature of the metal,



were always identical in tubes of the same dimensions and material. Another curious and unexpected fact brought out by the tests was that the folds or corrugations produced were

the same in number and in shape, whether—other conditions being equal—the compression was the result of a sudden shock or a slow steady pressure.

THE WATER AUTOMOBILE OF THE EVERGLADES



Engineers and Surveyors on Board the Water Automobile That Navigates the Florida Everglades

A really practical water automobile has solved one of the hardest problems incident to the draining of the Everglades of Florida: that of running the survey lines through the vast swamp. The machine, which so far has been given no name, was designed and constructed by Maj. J. O. Wright, chief engineer of the State of Florida. He built it because it was necessary in his business, and today engineers and surveyors running lines through the Everglades are blessing his name as they work in safety and comfort from the platform of the strange craft.

So slow and painful was the work of running the lines to mark the great canals designed to grade the Ever-

glades, that Major Wright was sorely puzzled, and on several occasions almost discouraged. Then he put his wits to work, determined not to be beaten by a lot of water and a few millions of acres of soft, black mud, and as a result the water automobile came into existence.

The machine was not built for beauty, nor for speed, and it glides over the glades and through the water at a rate of only three miles an hour, but it has proven itself effective. It consists of a framework of light steel and oak, 25 ft. long and 8 ft. wide, mounted on three wheels, the two in front being of iron and very wide-rimmed, so as not to cut into the soft mud over which the machine has to

pass. The rear wheel is a large wooden roller or drum, designed to crush down the tall saw grass as the craft proceeds. Surrounding the framework, and only a few inches above the ground, is a large air-filled steel cylinder, which keeps the machine afloat while crossing sheets of water. In the "bow" of the craft is a gasoline engine, which transmits power to the front wheels when the machine is crossing surfaces on which the wheels may be driven, or to an ordinary screw propeller, such as used on motor-

boats, for propulsion through the water. This propeller is under the machine, back of the front wheels, well out of the way when the machine is traveling as a land automobile.

On the framework of the machine is a platform, strong enough to hold a score of men. Here the engineers and the surveyors work, eat and sleep, an awning keeping off the direct rays of the sun. Two men are required for operating the machine, which is doing in a day work that formerly required a week or more.

THE SHIELDS OF THE PARIS POLICE

In the August issue of this magazine was published a short article with illustrations of the riot shields designed



A Type of Shield being Used by the Paris Police in Sieges Directed against Bandits and Rioters

for the Liverpool police following riots in which many members of the constabulary were severely injured by bombardments of bottles, brickbats, and other missiles.

In the accompanying illustration is

shown the same protective idea, as adopted by the Paris police for use in fighting barricaded bandits. The shields were used in a recent siege of automobile bandits and proved practical. Although much more unwieldy than the English shields, they provide protection for the entire body, when set on the ground in front of the user. They are not, however, designed to be carried about on the back of an officer, as are the English shields.

THE RUSSIAN GOVERNMENT AS A TEA GROWER

Near Batum, on the east coast of the Black Sea, the Russian government is busily engaged in the cultivation of tea. About 200,000 lb. per year is now grown, and the tea plantations are being extended at the rate of about 135 acres each year.

The government land devoted to this experiment in tea cultivation, and also to the cultivation of oranges and other fruits, and of bamboo, consists of 43,000 acres, which was formerly a hopeless tangle of rank vegetation. A considerable portion has already been cleared, the tea plantations covering about 1,400 acres at the present time.

Among the most important exports from Strassburg, Germany, are listed clocks, hair nets, goose-liver pies and rabbit skins, a queer assortment, but extremely valuable to the thrifty Germans.

TACTICS IN ACTUAL AERIAL WARFARE



The question of which aeroplane, the pursuer or the pursued, would have the advantage in an actual aerial combat was recently asked by the French aviation journal *L'Aero*. The question was formulated as follows:

"Assuming that two aeroplanes be flying at the same speed, the same altitude, and with equal armament, one pursuing the other; which, the pursuer or the pursued, can damage the other with the least risk of being itself damaged?"

The experts requested to answer this question included engineers, scientists, artillery officers, etc., and the answers, some of which were accompanied by detailed and intricate calculations, were almost unanimous in declaring that the fleeing aeroplane would have all the advantages. It would be practically impossible, they agreed, in view of the great speed of the machines and

the strong adverse air currents, for the pursuer to inflict any serious damage by means of projectiles, while the fleeing machine could easily do considerable damage.

The advantages claimed for the fleeing aeroplane would consist not only in the longer range of its projectile (the difference was calculated by one expert to be at least 130 ft.), but also in the fact that an aeroplane rushing against a projectile

would naturally be liable to greater damage than one running away from it at great speed. It was concluded, in fact, taking into consideration the nature of projectile most likely to be discharged from aeroplanes, that the fleeing aeroplane would scarcely sustain serious damage even if hit. This was the opinion not only of officers of the army and navy, and of gunnery experts, but renowned mathematicians reached the same conclusions through considerations of a strictly theoretical nature.

"ROLLING" A ROOF

Steam rollers in paving and politics are common enough in America but a man-power roller of the type shown in the photograph is entirely unknown. One must needs go to the Orient to witness the scene here reproduced. It represents a resident of Bireh, Palestine, north of Jerusalem. The roof is of earth and the efforts of the fez-topped individual are directed toward making it rain-proof.

LIBRARY OF ELECTRICAL SCIENCE

Thirty thousand books and pamphlets, three-fifths of which deal with electrical science, have recently been added to the library of the Massachusetts Institute of Technology. The collection, which was once the property of the late George Edward Dering, an English inventor, noted for his eccentricities, was purchased by Theodore N. Vail, president of the American Telegraph and Telephone Company, and by him presented to the Massachusetts institute. The collection is valued at about \$100,000. For its maintenance Mr. Vail added several thousand dollars to his gift.

The claim is made that the Dering

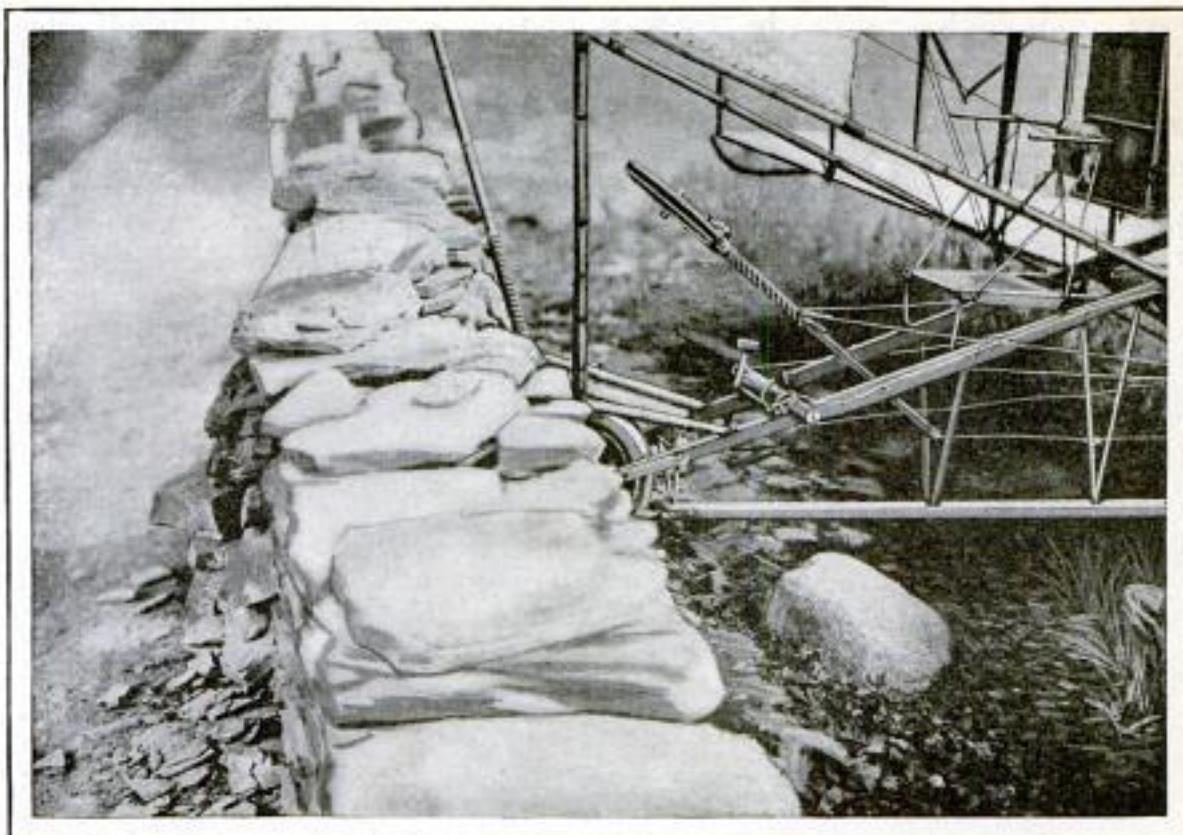
library is the most complete collection of recent works on electricity in the world, a possible exception being the library of the Institute of Electrical Engineers in London. Mr. Vail, the donor of the library, is not a technical man nor has he any connection with the Massachusetts institute, save in the employment of many of its graduates in his company. Mr. Dering, the collector, was a unique character. He was wealthy, but for many years lived practically a recluse. He spent more than 40 years acquiring the library and it became his chief hobby. He placed an unlimited order with a London bookdealer for all books on electricity, in whatever language offered. In addition he attended sales and obtained books from many other sources. It is said that probably 14,000 of the volumes had never been opened by him. The books in the collection not dealing with electricity are concerned with iron and steel.

The total number of volumes contained in the library of the institute now reaches 100,000.

A three-deck pontoon, 100 ft. long, has been built entirely of reinforced concrete for the Manchester ship canal.



A Native of Palestine Rolling His Dirt Roof to Make It Rain-Proof



An Aeroplane Which Came Out Better than a Stone Wall in a Collision at Hammondsport, N. Y.

AEROPLANE COLLIDES WITH STONE WALL

The operator of an aeroplane flying above the Hammondsport, N. Y., aviation field, failed to shut off his power early enough on making a landing and the machine ran into a stone wall. Although an aeroplane is usually credited with being of very delicate construction, the stone wall received the worst of the bargain. The collision moved approximately one ton of stone about 12 in., yet the only apparent damage to the aeroplane was a broken front wheel.

SPRING WATER FLOWS OUT OF TREE

A spring of clear, cold, sparkling water is always a welcome natural resource, but such a spring discharging its water out of the trunk of a stately elm tree is of unusual interest.

The tree-spring in question is near Lafayette, Ind., back of which are

hills containing several large springs. Some years ago one of these springs was piped to the foot of the tree, which had an opening in its base extending to



A Spring of Sparkling Water Discharging from an Elm Tree near Lafayette, Indiana

a considerable height in the trunk. The pipe was run underground into this opening and then up into the trunk. Then nature quietly concealed the work of man, and today there is no visible evidence of it.

The tree stands at the edge of one of the most frequented automobile roads in Indiana. Many automobile tourists see the water gushing from the tree, stop to investigate, but usually go away without having been able to solve the puzzle.

A NOVA-SCOTIAN AUTOMOBILE FAMILY "EN TOUR"

Miniature automobiles for children have ceased to be particularly rare in that the number of them is steadily growing, but the little machine used by Eva and Gladys Rafuse, of Windsor, Nova Scotia, is of considerable interest because it is part of the family caravan. The parents of the children ride in one of the smallest types of automobiles made for grown-ups, and this little "grown-up" car, running along a country road with the children's car leading the way, never fails to arouse admiration. The children's car, which is as complete in every detail as the larger car,

is operated by the elder of the children. Its power is derived from a 2½-hp. motorcycle engine, and is sufficient to negotiate any hill in the vicinity.

WIRELESS MASTS BUILT IN FOUR DAYS

The Marconi station at Poldhu, Eng., which has recently been adapted to receiving as well as sending messages, has established a record in erecting masts to support the aerial. Six masts, two of steel and four of wood, were put up in four days. The steel masts are 265 ft. high and the wooden ones somewhat shorter. The old wooden lattice columns have been demolished.

The two steel masts stand next the sea and support the triple stay of the aerial at a height of 250 ft. The wires run back from this in two groups of eight to stays supported by the wooden poles. No scaffolding was used in the erection of the tubular-steel poles. Instead they were put up section by section. Each section was 10 ft. long and semicylindrical in shape, with a flange at each end and longitudinal flanges down the sides. The halves of each cylinder were bolted together and then set on the flange of the one below



The Children Lead the Way in a 2½ Hp. Automobile, and the Parents Follow in the Smallest of "Grown-Up" Cars

and bolted to it. As each tubular section was put in place, a wooden pole was inserted in the upper end and used as a derrick to draw up the two semi-cylinders of the next section. These

were held on each side of the wooden pole until bolted together and fastened to the lower section. Then the wooden pole was withdrawn and the process repeated.

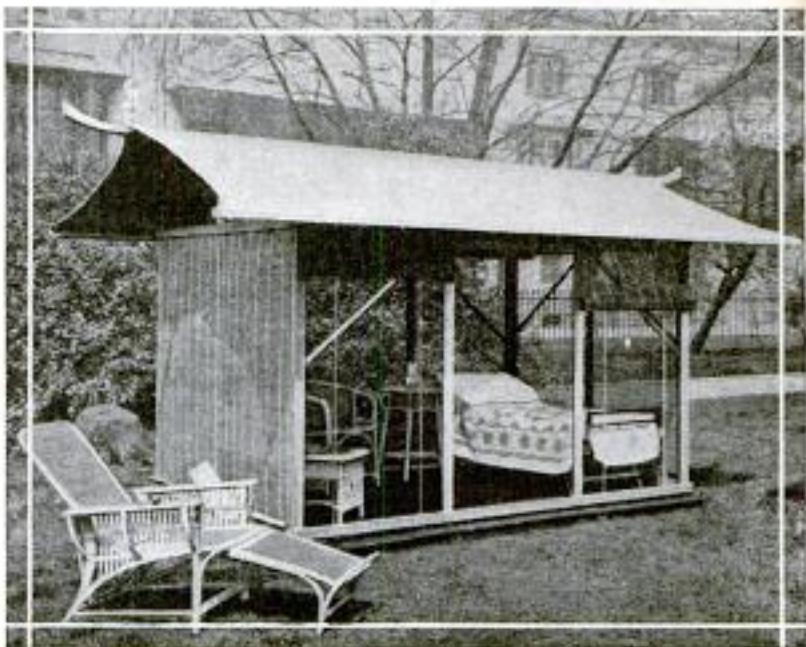
UNDERGROUND LAKE SOURCE OF WATER SUPPLY

For three years a commission of engineers have been attempting to solve the problem of obtaining for the Campine coal district of Belgium a supply of water from a subterranean lake discovered just prior to the appointment of the commission. A recent report states that the underground reservoir has an area of over 160,000 acres at a depth of from 80 to 100 ft., and that with a width of $1\frac{1}{4}$ to $2\frac{1}{2}$ miles it extends over the territories of eleven communities. At present Lower Belgium is dependent on rain water for its supply. The subterranean lake is said to provide the only source capable of supplying water to the population of Antwerp and Flanders, which in 25 years is expected to reach 4,000,000. To procure water from the subterranean source a system of filtering well shafts is recommended as allowing the water to be collected at a great depth without risk of contamination or of any change in its temperature. While the collected water is exceedingly pure, owing to the filtering properties of the soil, it contains a certain amount of iron from which it will have to be freed.

The British government has recently launched a motorboat of 200 tons' register, designed for the use of its consular service on the Congo River.

BAMBOO SHELTER FOR LAWNS AND GARDENS

A particularly practical and artistic portable garden house or shelter, oriental in general design, has been



An Artistic Portable Shelter for Town and Suburban Lawns

popular in England during the summer months. It is easily erected and moved, substantial in construction, and is made in sizes ranging from 5 by 7 ft. to 7 by $10\frac{1}{2}$ ft. Split-bamboo adjustable blinds are fitted on all sides, and may be raised or lowered by pulling the cords.

FIRE EXTINGUISHER FOR CABLE BOXES

A novel method of fighting fires which originate in telegraph, telephone and similar installations has been invented and gives promise of proving effective. In such installations bundles of cables are placed in boxes which render them almost inaccessible.

Short circuits, due to various causes, frequently occur and serious fires have resulted. Water cannot safely be used for extinguishing a blaze of this character as that would increase the danger of further short-circuiting. The inventor's method of extinguishing such fires includes a system of pipes by which two different extinguishing gases are conducted to the point of the

fire. There the gases combine, forming a powdery substance which stops the progress of the blaze. The gases are not retained in the pipes constantly, but when fires occur, the pipes are filled with the gases which are discharged at the required places. The gases employed are composed of ammonia and carbonic acid, or ammonia and sulphur dioxide.

PHOTOGRAPHIC STUDIO IN "DARKEST" AFRICA

Near Elizabethville, Congo, is a photographic studio in which white man or native can sit for a photograph and



A Well-Established
and Prosperous Photographic Studio in
Darkest Africa

rely upon a first-class likeness. The studio, which is constructed of bamboo poles and has a grass roof, was established a few years ago by an Englishman, who lays claim to be the pioneer photographer of Darkest Africa. He states that his most critical clients are the dark maidens of Congo, who are as particular about getting a good likeness as their white sisters, and who delight in posing.

NEW RECORDS ESTABLISHED BY SKYSCRAPER

The builder of the new 30-story office building on West Fortieth Street, New York City, makes claims of supremacy for it in several respects. While it does not attain the height of several other New York "scrapers," he declares it is the tallest building ever erected on so small a plot of ground—90 ft. by 98 ft. 9 in. In making this claim he adds others, including the following: That the new building is the only building of this height having an absolutely fireproof and smokeproof tower with entrance from the exterior, connecting at the bottom with the street; the tallest building ever erected on a side street; the only office building having every suite

above the fifth floor a corner suite; that it has the largest number of windows of any building in proportion to size; more windows than any other building of any description ever erected in proportion to area of ground covered, and, "probably," is the only building in the world that has not one particle of wood in its construction. No one has disputed these remarkable claims to date.

COMMENT AND REVIEW

NOT all persons upon becoming the owner of a motor vehicle imagine the price paid for the machine includes ownership of the streets, but a good many seem to have that impression. The change from dodging a car to being dodged is apt to be one in which the rights of the pedestrian are quickly forgotten. In our large cities the loss of life from automobiles and motorcycles has grown to be something frightful, and largely unnecessary. In some European cities the remedy is to arrest and fine the one who is so slow and stupid as to get run over—that is, if he survives. But no such process of law will be tolerated here, nor should it. On the other hand, motor cars are a modern necessity and the streets are no longer a safe place in which children can play. There must be moderation and caution on the part of both.

The enforcement of a reasonable speed reduces the accident and death rate to a minimum, and Chicago has demonstrated that such a reform can be easily accomplished in a few days. Several deaths each week from motors had rolled up a total of 75 in a short time, and something had to be done. This is the cure, and it was accomplished in a few days: While 15 miles an hour is the legal high speed, 20 miles was unofficially assumed to be the limit. Anyone exceeding that speed was promptly arrested and fined heavily, with the promise that the amount would be doubled for a second offense. Instead of the cases being brought before some friendly magistrate in the district where the arrest was made, all cases were heard by one judge. This permitted a system of records, with the promise that something beside fines would be imposed after the second offense. For about a week the fines aggregated over \$500 a day and then suddenly dropped. The effect was very noticeable after the third day; at the end of the first week there was really very little violation of the rules. The reform was accomplished so easily and quickly, that there seems no need for any other speed-infested city to longer tolerate such a needless condition of danger.

■ ■ ■

FLood control of the Mississippi valley was declared to be an engineering project second only to the Panama Canal, by the Deep Waterways Commission held in Chicago. It was agreed that only through Government could control be secured, but that returns from water powers thus created, and the sale of reclaimed lands would go far toward capitalizing the enterprise. The increasing volume of the annual floods was shown to be due not to any material increase in their original form of rain or snow, but to artificial conditions. In the northern states thousands of miles of tiling have been laid by farmers to drain swamps, low lands and small lakes, which enables the rapid escape of excessive water. Thus thousands of small harmless floods are dumped into the Mississippi to unite and descend in one overwhelming disastrous avalanche of water.

It was shown that the remedy for this need not be the discontinuance of drainage of northern low lands, but the construction of enough reservoirs to hold and control the abnormal spring freshets near their source. Also that

Control of Floods

How Speed Mania was Cured

great good could be accomplished if northern state farmers would plow their land from 12 to 18 inches deep, instead of 5 or 6 inches as at present. This would give the soil an opportunity to absorb and retain a much larger quantity of moisture, amounting to as much as 40 to 50 tons of water per acre, and which, it was claimed, would increase the value of crops throughout these states fully threefold.

One of the interesting developments of the convention was the announcement that there are three possible routes for the diversion of excess water of the upper Mississippi by canals to Lake Michigan: First, from St. Paul to Green Bay, 259 miles; second, LaCrosse to Milwaukee, 185 miles; and third, Galena to Chicago, 152 miles.

The damage caused by the 1912 flood is estimated at \$200,000,000. Two such floods alone cost as much as the Panama Canal.

The subject is one which is bound to receive attention from now on, and will be considered at the meeting of governors at Richmond, at which time a permanent board will be appointed to investigate and report.

■■■

THE destruction of the great aircraft "Akron" was accomplished with a suddenness which is appalling—being reduced to nothingness literally in the twinkling of an eye. The event is doubly deplorable, chiefly for the loss of its brave men, but also for the failure to accomplish that greatest of attempted aerial feats—the crossing of a vast ocean. In all probability safety devices were responsible for the disaster—and what was calculated to save life operated with contrary result. To prevent the bursting of the envelope when the contained gas expanded from the sun's heat, six safety valves were installed to relieve unusual pressure. These valves, it seems, exhausted gas at points perilously near to the engine exhausts, which frequently spit sparks and fire. If the undertaking was destined to end so tragically, we may be thankful to be spared the long days and nights of uncertainty which followed André in his disappearance.

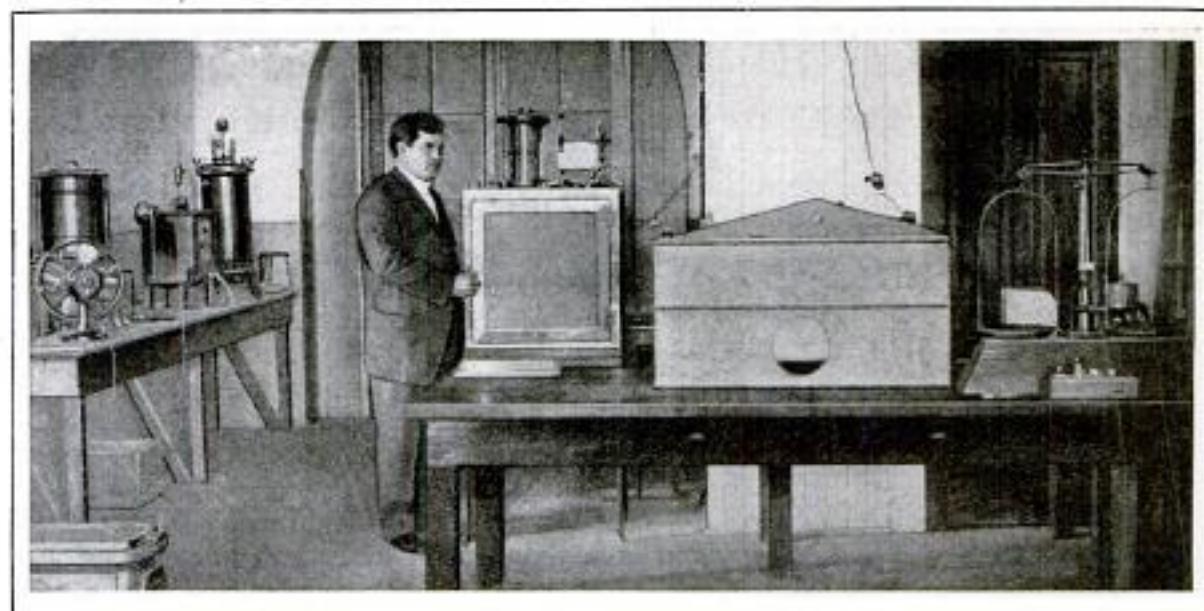
If the ocean could be crossed at this time by any man in a dirigible, surely Vaniman with his training and experience was well qualified to accomplish it. And while the disaster will likely defer the time of another similar effort, it by no means follows that no more attempts will be made.

The "Akron" undoubtedly embodied the best that experience could suggest, skill could fabricate, or money buy.

The final cruise of the "Akron" has resulted in little more than emphasizing the difficulties and dangers of piloting a big dirigible across the Atlantic. That they played and lost should not detract from that measure of admiration which is due the brave young men who staked their lives on the chance to write their names high in history. America is indebted also to those other men who provided the princely fortune that was spent in building the huge aircraft. Evidently we are yet knocking at the outer gate of air conquest, and many more brave lives must be yielded up before the secret of scientific aviation is wrested from its stronghold.

*Future
of the
Dirigible*

H. H. WINDSOR



Experimental Apparatus for Artificially Ripening Dates, Showing Electric Ovens

RIPENING DATES IN AN INCUBATOR

The discovery of Prof. G. F. Freeman, of the Arizona state experimental station, that the incubator will ripen dates to a perfection that rivals the fruit brought direct to the Paris markets from Africa has revived the interest of the fruit growers of the Salt River Valley in Arizona, and today the fruiting date palm is being extensively cultivated.

When, some 10 years ago, the United States Department of Agriculture sent a large consignment of the choicest varieties of date palms to Arizona they were planted, but when the fruit began to develop, difficulty was experienced in securing a date that was of value commercially.

Hot water, vinegar, gasoline, and a score of other substances were found that would ripen dates artificially. Of these vinegar was found best suited for practical work, but still the experimental station was not satisfied with the result.

It remained for Professor Freeman to attempt submitting ripening dates to the heat of the incubator, and the experiment was a pronounced success. Now the dates are picked when they show the first signs of ripening; are washed and placed in an oven where

they are kept in a moist atmosphere and held at a temperature of between 110 and 115 deg. F. for three days. At the end of this time they are fully ripened.

LEGAL STATUS OF AIRMEN IN ENGLAND

In spite of the great strides which have been made toward complete conquest of the air, the flyer is as yet almost an unknown quantity with regard to his rights and privileges in legal circles. This fact was brought out in a recent suit for damages instituted by Alfred Rawlinson, an English airman, against the promoters of the air meet at Bournemouth in July, 1910. Rawlinson charged that the starting ground was not properly prepared and as a result he met with an accident in which his leg and shoulder were broken. At the hearing dense ignorance of airmanship was displayed by both judge and counsel, the former stating that he knew nothing about flying, and Rawlinson's own lawyer said he believed "the aeroplane was attached to hooks in the ground" before starting.

A NEW ENGLISH FIRE-ESCAPE TRUCK

The fire department of Birmingham, Eng., has been testing a new type of fire escape by which the persons res-



The Cradle or Cage of a New Type of Truck Fire-Escape Tested in England

cued reach the ground in a cage or cradle raised and lowered by means of a cable, and guided by side cables. The apparatus is run to a fire in the same manner as a ladder truck, the escape tower is then extended up along the building, and the cradle is raised and lowered like an elevator cage.

The cradle is provided with an automatic brake which fixes the cradle on the guide cables should the lifting cable break.

Hubert Latham, one of the pioneer airmen who quit flying because of the danger, was recently killed by a wild buffalo while hunting in the Chari River district of French Sudan.

SPECIAL DRILL FOR CANAL-LOCK GATES

Sixteen electric machines have been specially built for use in drilling and reaming rivet holes in the lock gates of the Panama Canal and are now in operation. The machines are of such a character that they can readily be adapted to similar use on other large contracts after the canal is completed. They are not the first pieces of machinery which have been created especially for use at the "big ditch," but they possess several improvements.

Each of the machines weighs 6 tons and is designed to run on a standard-gauge track which is placed on a stage and swung from the top of the big steel gate on chains and brackets. It is claimed that each machine does the work of five ordinary reamers. Each machine is provided with four changes of power which are instantly available by means of a quick-change gear. The two distinguishing features of the machines are the range of nine speeds, and the fixed spindles arranged to space the rivet holes in the lock gates uniformly.

CONCRETE-WORK CRACKS BEING STUDIED

Cracking of concrete due to variations in temperature is deemed a matter important enough to receive attention from the National Bureau of Standards, of the Department of Commerce and Labor. In order to obtain statistical data, reference marks have been placed on typical old and new concrete work in Wayne County, Mich., and at Greenwich, Conn. During the summer and winter measurements will be taken to determine the expansion or contraction caused by high and low temperatures. The change of volume taking place during the hardening process will also be considered. The lock walls of the Panama Canal and various other structures from which data valuable to builders will be collected have been similarly marked.



Children Fishing for Carp in a Los Angeles Park

CARP FISHING IN LOS ANGELES PARK

Thanks to an over-production of carp in the Los Angeles parks, the children of that city were recently given an unexpected fishing treat. The lakes at Echo, Eastlake and Westlake Parks were opened to anglers under 16 years of age, and hundreds of children responded to the invitation of the park commission. The limit for each catch was 12 fish, but as the carp weighed from a half to more than a full pound, this was a liberal allowance and no one objected to the restriction.

The banks of the little lakes or ponds were for days lined with happy youngsters armed with all kinds of tackle, from the bent-pin, cotton-string and broken-branch variety to the split-bamboo pole and braided-silk line borrowed from "dad's" vacation outfit.

Dough or bread was the most acceptable bait, and the carp fought greedily for it the first few days, and fishing was rapid-fire work. Toward the end of the first week, however, they became more wary, and the children learned the lesson of fisherman's patience.

THE NEW OPEN-WORK STOCKING

The up-to-date open-work stocking, fashionable this summer, differs from its predecessors in the past in the great size of the mesh. An English magazine characterizes it as "one of the net results of fashion," and it certainly is netlike in appearance, closely resembling a veil.

An interesting result of the "Titanic" disaster is the determination of the family of the late Isidor Straus to perpetuate the name of the famous merchant and philanthropist who sank with the big ship, by always having an Isidor Straus in the family.



Courtesy the Sketch, London

BAGGAGE ROOM OF AN AERIAL EXPRESS

Provision for the carriage of baggage is as necessary on an aerial express as on a land express, and in the



Courtesy the Sketch, London
Small Baggage Piled in the Baggage Section of
the "Clement-Bayard IV"

illustration may be seen the baggage section of the "Clement-Bayard IV," one of the latest of this famous type of dirigible balloon. Traveling bags, rolled steamer rugs, and canvas bags are piled at one end of the car.

LUBRICANT TESTS MADE BY MACHINE

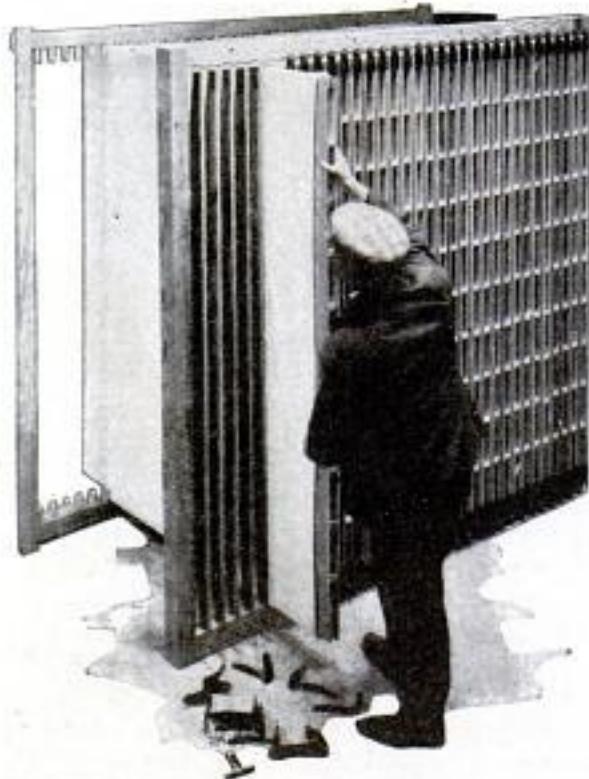
The quality of lubricants used on fine machinery of various kinds is a matter of great importance and one that has long engaged the attention of engineers. To avoid the necessity of testing the lubricants on expensive machinery, and to economize time, an English concern has developed a machine which is used exclusively for this purpose.

Steam is used in the process of determining the quality of various oils and showing to what degree, if any, dis-

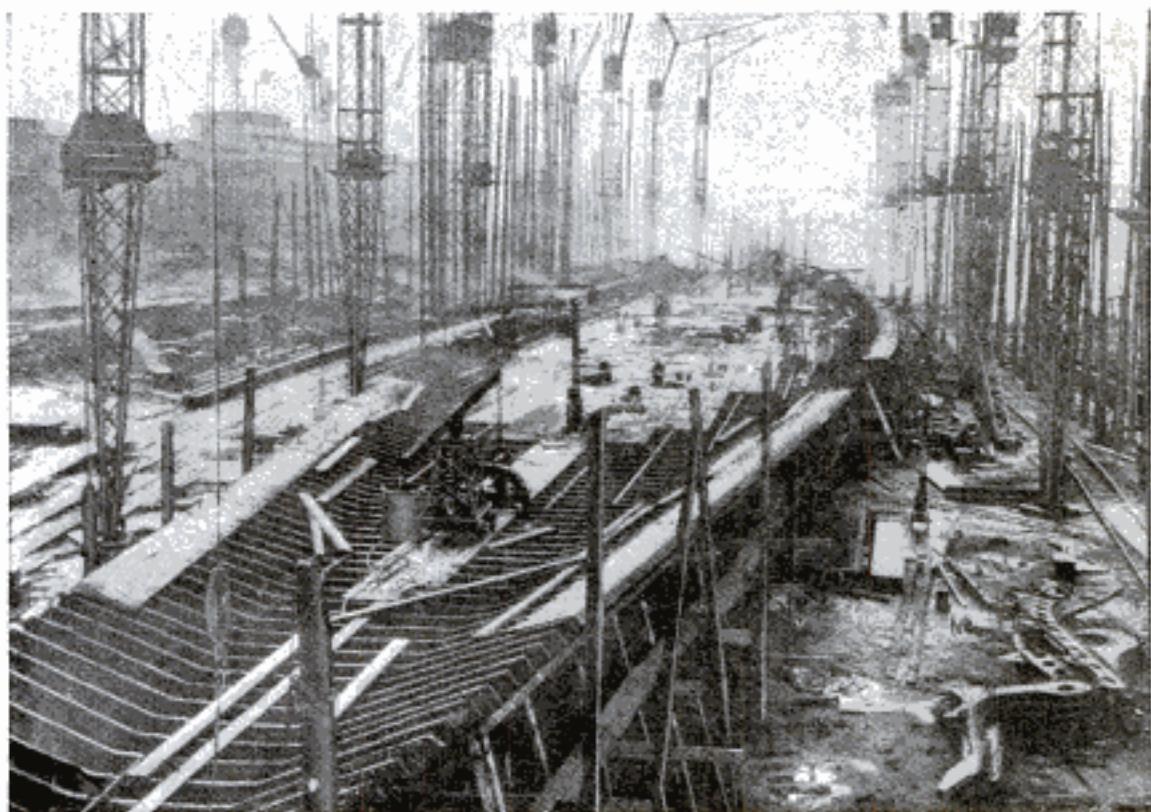
integration and formation of sediment takes place. After the test is completed the oil is blown onto a slip of paper, and the changes it has undergone during the test are then disclosed. A further test follows, to determine what alterations affecting its lubricating properties result from the effect of heat. With automatic precision the machine indicates, on the same slip of paper, the degree of friction and the temperature of the frictional surfaces, as well as the absolute and relative values of the oil under test. The number of revolutions made by the machine in testing the oil also is indicated.

FILTERING AIR FOR DYNAMO ROOMS

All air that enters rooms where electric generators are operating is kept clean by a novel filtering apparatus in the great electric-railroad power plant at Altona, Germany. The elimination of dust from around dynamos is no new idea, and is of great value in the operation of the machinery, but in this



Inserting a Clean Cloth-Covered Pocket in an Air Filter Built Up in Sections



View of the Watertight "Tank Top" on the "Aquitania," Now Building in England, Which is to be the Largest Liner

instance the idea has been worked out so that the filtering will take comparatively little attention.

Wooden cases which contain the dust-proof cloth are built so that each separate filtering pocket can be removed from the frame without disturbing the others, thus making it possible to easily remove soiled or damaged pockets. As each pocket, covered with cloth, is inserted in the frame, the necessary tension to the cloth is developed automatically, and no eyelets are needed in the cloth, thus avoiding trouble in laundering or in cleaning with a vacuum cleaner. Another advantage is that the filter can be increased or decreased readily in size by adding or taking away pockets at the ends.

Although the automobile may be displacing the horse, it is interesting to note that no less than \$4,000,000 was given for prizes at horse races in the United States and Canada last year.

NEW OCEAN LINER WILL HAVE "TANK TOP"

Details of the construction of the "Aquitania," which is to be even bigger than the "Imperator," the largest ocean liner now afloat, are being withheld by the Cunard line, but some of the facts about the new vessel have come out, the most interesting being that the liner will have a tank top, so that there will be a watertight tank in the bottom of the vessel extending the entire length and breadth. The naval architect of the line testified at the British "Titanic" hearing that the "Aquitania" was to have a continuous watertight deck, presumably this being the top of the "tank."

The size of the vessel is not definitely known, but it is generally understood that it will be at least 10 ft. longer than the "Imperator," or 891 ft. The "Aquitania" will be driven by turbines of the Parsons type working four propeller shafts, the wing propellers being 86 ft. forward of the rear pair.



Courtesy the Sketch, London

Water Running with Aquatic Shoes at One of the German Watering Places

SKI RUNNING ON THE WATER

Many attempts have been made to design a water shoe which would be practical for everyday use, but practically all of them have failed because too heavy and cumbersome. The water-running shoes now being turned out by a German firm, however, are

said to overcome these difficulties, and are being used to a considerable extent at one of the German water resorts. The water shoes are about the size of snowshoes, and pointed at the ends. They are inflated with air before using.

SALAD DISH WITH ICE COOLER

Ice-cooled salad, without contamination by direct contact with the ice, is made a simple matter by the device shown in the illustration. The dish is constructed double, so that the ice may be placed between the inner and outer bowls, and the salad kept cool in the inner bowl.



The use of the aeroplane and the need for better materials in its construction than have heretofore been necessary have brought into existence a steel wire to be used for guys which has a tensile strength of 350,000 lb. per square inch, despite the fact that it is only from $1/50$ to $1/10$ of an inch in diameter.

PREDICTING EARTHQUAKES

That earthquakes of the future may be accurately predicted is again promised, this time by M. Koeveslighety, a scientist who has been investigating the origin of the phenomenon. He does not claim the problem is entirely solved, but announces that with means already available, quakes may be foretold with a degree of accuracy. He considers the primal cause of the earthquake not an external factor, whether of the earth's crust or due to atmospheric conditions. These elements, in his belief, merely precipitate the shock, which is actually due to excessive tension at some point, the essential thing being to determine where such tension exists. The speed with which ordinary earth waves travel, as recorded by a seismograph, will indicate

the amount of tension, and thus furnish the basis for predictions.

"ATMOSPHERE" IN STAGE LIGHTING

Fortuny, a Parisian scenic artist, has invented a new and wonderful stage-lighting arrangement, differing entirely from the methods hitherto in vogue. His scheme, which has been successfully introduced in the Royal Opera House, Berlin, and is now being installed also in the new Comedy House at Frankfort-on-the-Main, consists of an arrangement of white muslin, covering the stage and forming a hemisphere upon which the light is projected. The claim is made that this produces a more natural diffusion of light and makes possible intricate lighting effects which could not otherwise be obtained. On account of the equalization of the projected light on all parts of the stage through the new method, even the time-honored foot-lights are rendered useless and will be abandoned. Moving clouds, waves and other effects are easily obtainable by throwing the proper slides on the hollow hemisphere of muslin and colored effects are produced by passing the light rays through suitably colored cloth screens.

LIFEBOAT LESSON IN SHIPYARD

The lesson of the value of lifeboats, in spite of all the contentions that a lifeboat is too unstable to do more than satisfy the anxieties of passengers, has been present all this year in the yards of a shipbuilding concern in Delaware, and forms an excellent answer to some of the testimony developed in the British "Titanic" hearing. It is a boat which withstood three

days of storms on Lake Erie last December and was still seaworthy when picked up by a passing steamer. The boat had been launched from the steamer "Marquette Bessemer No. 2" when that vessel was foundering, and when picked up by the "Commodore Perry" the nine men who manned it had all died from the intense cold.



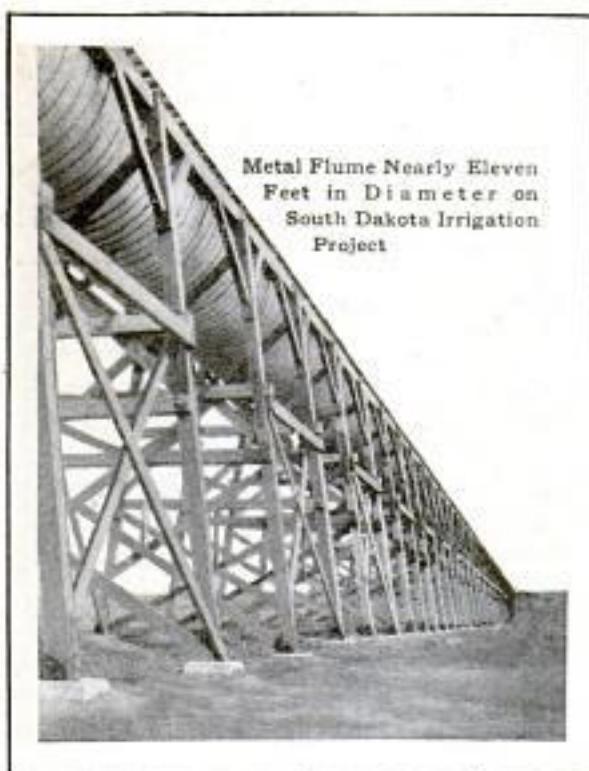
Lifeboat of "Marquette Bessemer No. 2" Which Flew through Three Rough Days out on Lake Erie

Yet, without any crew to steer the boat, and in spite of the lack of balance, due to the uneven distribution of the bodies, the boat had kept up.

MONSTER METAL FLUME FOR IRRIGATION

A monster iron flume has been erected by the United States Reclamation Service at Belle Fourche, S. D., which measures 1,300 ft. in length and 10 ft. 10 in. in diameter and is made of No. 16 gauge so-called Toncan metal. This is a very pure iron which, although made by improved methods and on a large scale, is said to be almost identical in composition with irons produced by the slow and complicated processes of centuries ago, but which had more lasting qualities than the modern product.

A large proportion of the flumes installed during the past year were of this type, including one in Massachusetts, where irrigation is a rarity. A mile of twin flumes of a diameter of 9 ft. 6 in. each, which will eclipse the Belle Fourche flume in length, are now being installed for irrigation service.



Metal Flume Nearly Eleven Feet in Diameter on South Dakota Irrigation Project

These iron flumes were designed and constructed in sections at Denver, Colorado, and are galvanized to resist corrosion.

REINFORCING STEEL WATER TANKS WITH CONCRETE

Recent unexplained failures of large steel water tanks in various parts of the country have caused the Los Angeles water department to reinforce a 528,000-gal. steel tank with concrete. The capacity of the tank was increased to 593,000 gal. by adding 5 ft. to the height, and the steel shell was incased in reinforced concrete having sufficient strength in itself to withstand the hydraulic pressure with an ample factor of safety.

The jacketing of the black steel shell is also a great improvement from an artistic standpoint, as the tank is visible for many miles up the San Fernando valley. The ordinary tank in such a location is distinctly an eyesore.

EFFECT OF DREDGING ON "SWELL"

During the last four years the River Weir Commission of Sunderland, Eng., has been watching the effect of deepening the harbor, by dredging, on the swell which has been conspicuous at that point. A pier of which 2,676 ft. had been completed, leaving 168 ft. to be constructed, was left untouched during this period in order to ascertain what effect, if any, the increased depth of water and expansion of navigation channels would have in leading the swell into the harbor. It has now been found that the dredging has not resulted in any appreciable difference. In view of this result the pier will not be extended beyond its present length more than may be necessary to complete the unfinished end in a permanent manner.

EDIBLE BOUQUETS REPLACE BOXED SWEETS

The fashionable feminine theater-goer in Paris no longer carries a box of sweets with her, but is provided by her escort with a dainty bouquet of crystallized flowers, such as violets, rambler roses, etc., artistically mounted on stalks, with petals made of thin



The Candied Bouquet Which is Taking the Place of Boxed Sweets for the Theatergoer

strips of candied peel. This bouquet is picked to pieces and eaten during the performance, all of it being edible.

Congress has been asked to authorize international gold notes for the convenience of travelers with values printed in currency terms of all nations.

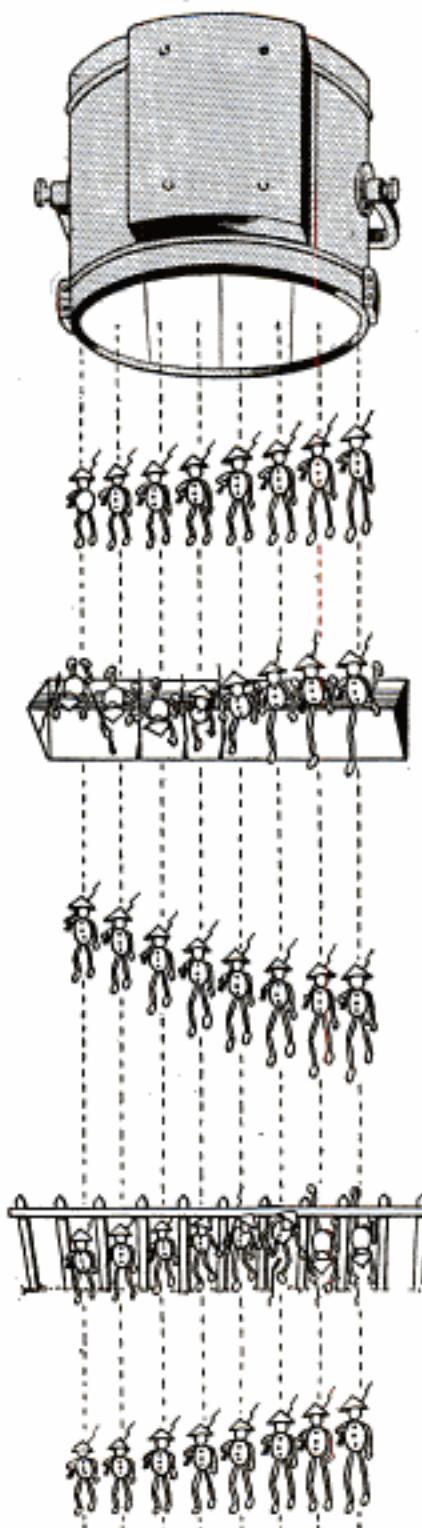
THE WONDERS OF LIGHT

VII—The Magic of the Rainbow

WE do not know what primitive man thought of the rainbow. Probably much the same as his descendants of a hundred thousand years later. The average man of today accepts the rainbow as a simple matter of fact, just as he does a sunrise, a star, or a flower. It has no deeper meaning for him, nor does he take the time and thought necessary to understand what is really a puzzle to him. Familiarity with any of the wonderful phenomena of nature is too often mistaken for understanding.

The great bow of gorgeous colors far-flung across the sky is one of nature's most impressive object lessons. And yet, in all the ages that have elapsed since man appeared, history tells us but little of any progress made in the explanation of the mysterious arch of colors. It was accounted an object of superstitious awe, a portent of the gods, a riddle too complex for man to unravel, or else, because it was seen so often, it had become commonplace like many another of nature's phenomena.

Color was considered as a property of matter. Everyone had observed the beautiful colors in splintered ice, the chromatic glories of a diamond or cut-glass prism,



The Brotherhood of Light Rays. The top row represents one white ray of light, symbolized by a platoon of soldiers, of the various elements of a white ray, marching in perfect alignment, although some have longer legs (longer wave lengths) than their brothers. Obstructed by a prism of glass, the long-legged ones get over first, and so form a curved line—the spectrum of a ray of white light. It is possible to turn a spectrum back into a ray of white light, symbolized here by sending the soldiers under a low fence.

By
J. GORDON OGDEN, Ph. D.

the iridescence of a polished shell, the shining luster of a film of oil on water, the marvels of a soap bubble, and the myriad hues of a rainbow, but no one thought that all these color phenomena were closely related. No one imagined them to be children of the same parent, and that the redness of a blush rose is due to the same cause that produces the wondrous harmonies of a sunset, the flush in the cheek of a maid, and the glittering brilliancy of an Arcturus billions of miles away in the depths of the ether. And not even in the most fantastic dreams of the poets and philosophers of old was there anything remotely prophetic of the fact that one day these colors would reveal the chemical components of the universe, and enable man to analyze in his laboratory, suns and stars, flashing afar in the infinite realms of space.

Kepler, a celebrated German astronomer (1571-1630) was probably the first to describe the effect of a prism upon white light, while Sir Isaac Newton (1642-1727) was the first to offer a scientific explanation of what takes place when a beam of white light is splintered into the wonderfully pure and beautiful colors,

identical with those of the rainbow. Newton's description of his famous experiment is worth reading, and we

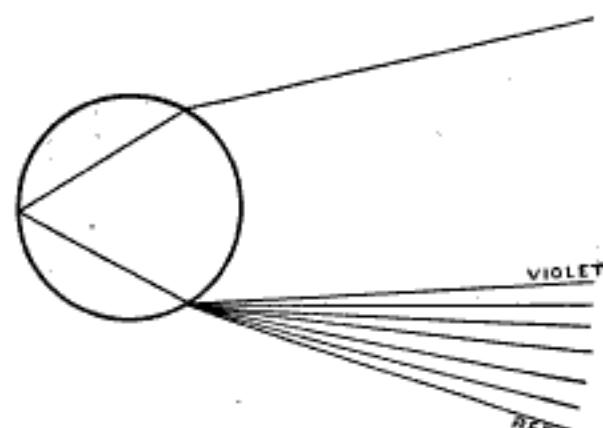


Fig. 1—A Ray of White Light Entering and Leaving a Drop of Water

therefore reproduce it, using his own words and spelling:

"In a darkened room make a hole in the shutter of a window whose diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Sun's light; and there place a clear and colourless Prisme, to refract the entering light towards the further part of the Room, which, as I said, will thereby be diffused into an oblong, coloured Image. Then place a Lens of about three foot radius (suppose a broad Object glass of a three foot Telescope), at the distance of about four or five foot from thence through which all these colours may at once be transmitted, and made by its Refraction to convene at a further distance of about ten or twelve feet.

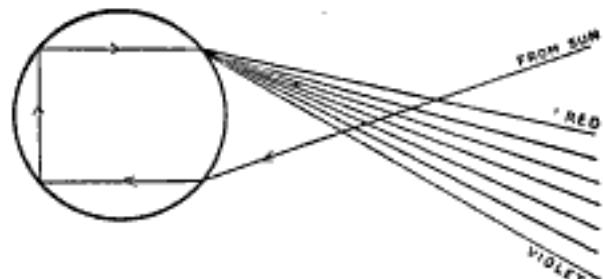


Fig. 2—A Ray of Light Entering a Drop of Water from Below is Twice Refracted

If at that distance you intercept the light with a sheet of white paper you will see the colour converted into whiteness by being mingled. But it is requisite that the Prisme and Lens be placed steady and that the paper on

which the colours are cast be moved to and fro; for by such motion, you will find not only at what distance the whiteness is most perfect, but also see how the colours gradually convene and vanish into whiteness, and afterwards, having crossed one another in that place where they compound whiteness, are again dissipated and severed and in an inverted order retain the same colours which they had before they entered the composition. You may also see that, if any of the colours at the Lens be intercepted, the Whiteness will be changed into other colours. And therefore, that the composition of whiteness be perfect, care must be taken that none of the colours fall beside the Lens."

Newton, however, since he was an advocate of the corpuscular theory of

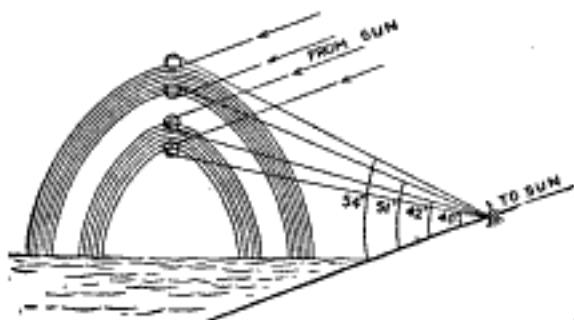


Fig. 3—Primary and Secondary Rainbows with the Angles at Which the Various Colors are Seen, Violet being 54 Degrees in the Secondary

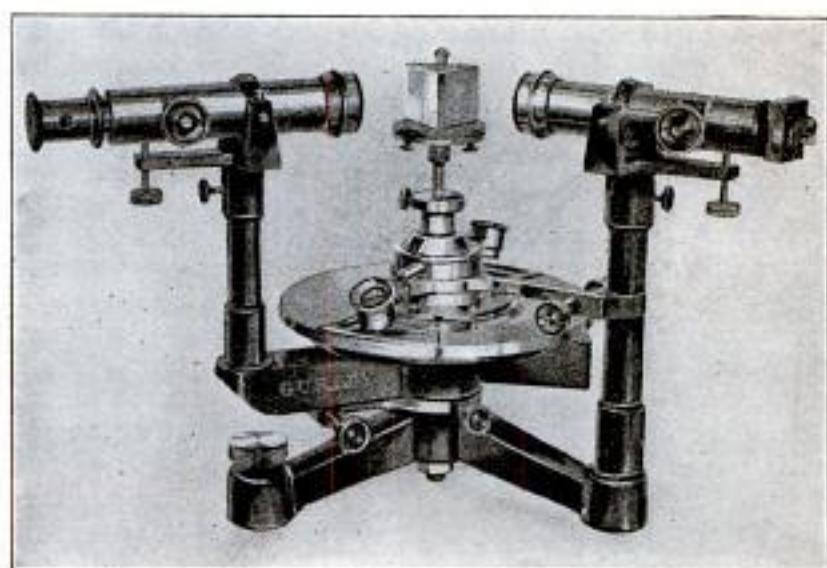
light, could not give a correct explanation of the phenomena he had witnessed, as the undulatory theory of light is essential for a full understanding of this beautiful dispersion of white light into the rainbow hues.

Even as the alchemists of old named the vapor that distills from a solid or liquid when heated, a "spirit," and as Van Helmont gave the name "gas," from the German word "Geist," a ghost, to the invisible something that is mysteriously given off when certain substances are heated, so Newton gave the name, "spectrum" identical with our word "specter"—an apparition—to this band of colors, and so it has been termed ever since. It is also claimed that Newton named seven colors in the spectrum for the reason

that the number seven was a significant and peculiarly sacred number to the alchemists and astrologers of the time. As a matter of fact, there are at least two millions of separate and distinct colors in the solar spectrum, and the common division into seven is meaningless.

And now, what is a rainbow? Whence the colors? Why is it always an arc? In a former chapter we discussed the effect of a prism on light, and studied the cause of the bending or refraction thus produced. We are now ready to study another effect of this same bending or refraction when white light is permitted to pass through a prism.

White light is really a brotherhood made up of every wave length capable of affecting the optic nerve. Short waves, $1/64,000$ of an inch in length, long waves, $1/34,000$ of an inch, together with myriads of waves intermediate between these two lengths, travel through the vast abysses of the ether with precisely the same velocity. The tiny violet waves make just as good time as their big brothers, the red waves. Trouble comes to the brotherhood when it strikes a medium different from the ether—glass, for example. The red waves, being longer, pass on



The Spectroscope, by Means of Which the Spectrum of a Ray of Light is Studied

permitted to pass through a prism. White light is really a brotherhood made up of every wave length capable of affecting the optic nerve. Short waves, $1/64,000$ of an inch in length, long waves, $1/34,000$ of an inch, together with myriads of waves intermediate between these two lengths, travel through the vast abysses of the ether with precisely the same velocity. The tiny violet waves make just as good time as their big brothers, the red waves. Trouble comes to the brotherhood when it strikes a medium different from the ether—glass, for example. The red waves, being longer, pass on

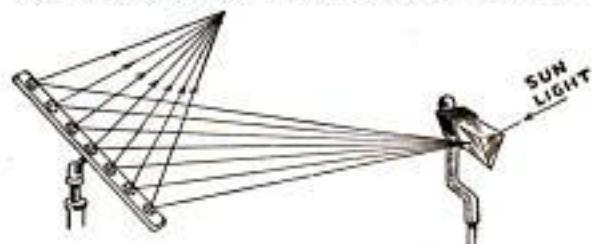


Fig. 4—The Dispersion of a Ray of White Light Passing Through a Prism and Subsequent Uniting of the Rays

through a glass prism without much difficulty, the only noticeable effect being a slight change in direction after emerging from the glass. The other waves, violet most of all, seem to be

more or less entangled with the electrons of the glass, and are bent away from their original course much more

than the red waves. Hence when all the waves finally emerge, the brotherhood is broken up. This phenomenon is known as dispersion, and is illustrated in Fig. 4. This at least is the popular conception of what takes place in a prism. Strictly speaking, there are no colors in white light—just waves of different lengths. Color is subjective, and as we have shown, exists only in the brain. White light is a sequence of irregular wave trains, and a prism simply analyzes them into simpler trains that we recognize as colors. These simpler trains may be still further divided into their components, and it is quite impossible to say where this analysis must cease. The difference between sunlight and colored light may be understood by comparing the effect produced by forcing a yardstick down on the keyboard of a piano, and afterward striking a single key with the finger. White light is a discord wherein all the color tones are blended. A pure color is a single tone in the scale—a single wave length.

What has all this to do with a rainbow? Simply this: A raindrop is a double convex lens, made up of two prisms placed base to base. These prisms are just as much prisms as

though they were made of glass. The brotherhood of light is broken up by the raindrops, and each of the brethren, free from one another, races down to the eye of the observer, and causes the sensation of color. As we see an object in the light that comes from it, the various drops of rain, seen at slightly different angles, seem to be colored—and we have the rainbow.

Figure 1 represents what happens to a ray of light when it enters a drop of water at the proper angle. It enters from above, is slightly bent, then totally reflected at the far side of the drop, and then leaves the drop just below the point of entry, bending again as it passes out, producing dispersion. Rays of light that enter the lower part of the drop are refracted twice, and totally reflected twice (Fig. 2). These latter rays create what is known as the secondary bow, which lies outside the primary bow. The secondary bow is always dimmer than the primary since the light passing through it is twice reflected, there being a loss at each of the so-called "total" reflections.

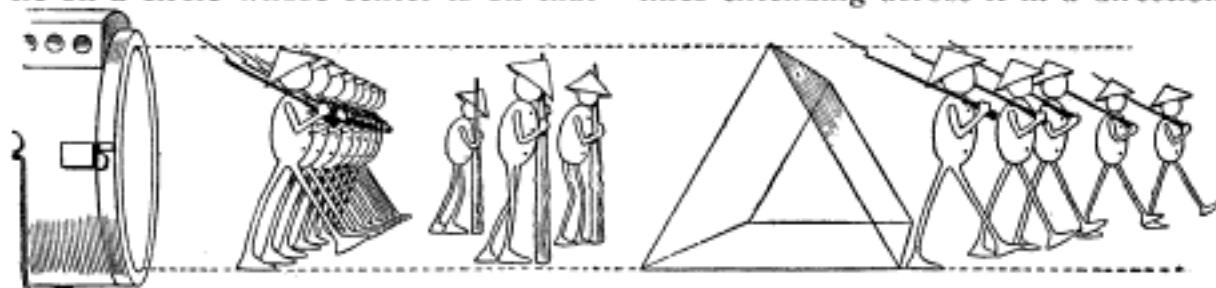
In the primary bow the light from the violet drop must enter the eye of the observer at an angle of 40 deg. to the line drawn from the eye of the observer to the sun, as shown in Fig. 3. The light from the red drop must enter at an angle of 42 deg. Similarly, in the secondary bow, the angle for the red must be 51 deg., while the violet must be 54 deg.

It is quite evident "that those drops whose direction from the eye makes any particular angle with the line drawn from the eye to the sun, must lie on a circle whose center is on that

line. Hence we see a circular arc of light which is violet on the inner edge, and red on the outer edge in the primary bow, and red on the inner edge and violet on the outer edge in the secondary bow."

The rainbow shimmering high in the heavens is more than a mere arch of glowing colors. It is a royal ambassador from the kingdom of nature, a herald bearing a message of vast importance to mankind. Written upon its brilliantly hued, shining archway, is a truth that man has finally appreciated after the countless ages that have passed since the first rainbow glorified the heavens. And this truth is what? Nothing less than the revelation of the component elements that constitute the sun and stars and the dim-shining nebulae lost in the farthest hiding places of the universe. By means of this truth, written large upon the raindrops, we know more about the composition of the sun, 93,000,000 miles from the earth, than we do about the world on which we dwell. Let us review our knowledge of this wonderful property of light. It is not hard to understand.

Just one hundred and thirty years after Newton's famous experiment, in other words in the year 1802, Doctor Wollaston, an English philosopher, discovered, on repeating Newton's experiment with the prism, a peculiar difference in the spectrum when the light was allowed to enter the prism through a narrow slit, instead of a round hole. The spectrum appeared to be no longer continuous, but was broken, here and there, by numerous dark, threadlike lines extending across it in a direction



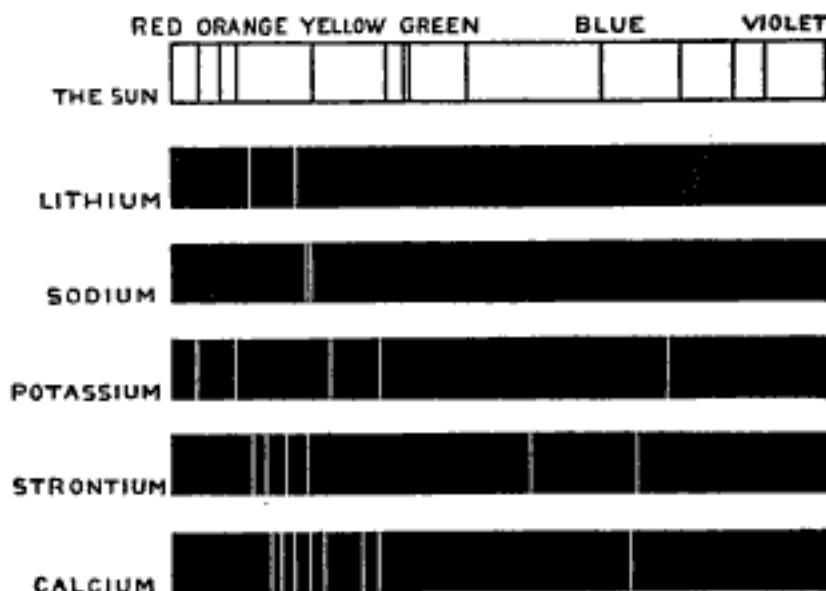
How the spectrum shows what gases a ray of white light has passed through. If a ray of white light, indicated by the line of little soldiers, passes through some glowing gaseous element, some of the brotherhood are killed. Then when the line of soldiers passes the prism and is thrown into a curved front—the spectrum—it is immediately noticeable which are missing. The scientist knows just what gases would account for the killing of any little soldier.

parallel to the ends of the prism, Newton had not observed this phenomenon although he, too, had used a slit in his further experiments in dispersion. Considerable attention was attracted to this curious discovery, but no one understood its wonderful significance. In 1815, Fraunhofer, an optician of Munich, studied these lines with extreme care. He mapped no less than 700 of them, designating eight of the most conspicuous by letters of the alphabet. These positions follow:

- A — Beginning of Red
- B — Middle of Red
- C — Beginning of Orange
- D — Middle of Yellow
- E — Middle of Green
- F — Beginning of Blue
- G — Middle of Indigo
- H — Middle of Violet

What is the meaning of these Fraunhofer's lines? What is their cause? Evidently something happens to sunlight when it passes through a prism, that does not happen to the light from a candle or lamp when it is treated in the same manner. A candle, lamp, or arc light will produce a continuous spectrum, without any sign of a dark line. What becomes of the lost sunlight that properly belongs where the dark lines appear? Let us perform a simple experiment that will put us in the way of finding out the truth. If light from an alcohol lamp whose wick is strongly impregnated with common salt is passed through a prism, an intensely bright line, yellow in color, will be its spectrum. Now, if sunlight is passed through a prism and its spectrum thrown directly above or below the spectrum from the burning salt, so that the two spectra may be compared, it will be found that exactly opposite the bright yellow line produced by the salt, or sodium spectrum as it is termed, a dark line appears in the sunlight spectrum. This is the "D" line in Fraunhofer's classification,

and is really a number of lines very close together. This "D" line is therefore a bright line in the sodium spectrum, and a dark line in the sunlight spectrum. Now, if this "D" line is due to sodium, it is evident that the sodium



Fraunhofer's Lines, in a Spectrum, Showing Location of Lines Which Indicate the Ray of Light Passed through the Elements Named

light has been taken out of the sunlight, in some way or other. Let us go on with our experimentation. Suppose we pass a beam of strong, white light from an arc lamp through a prism and thus obtain a continuous spectrum. Then let us interpose between the arc light and the prism, a glass tube or other transparent holder, containing the highly heated vapor of metallic sodium. Instantly a dark line appears in the very place where the bright yellow line appeared in our first experiment with the alcohol and salt. The sodium vapor has absorbed or quenched precisely those rays which the vapor itself gives out when it is glowing. And now, since the sunlight was robbed of this same yellow line, does it not follow that the light from the sun must have passed through a glowing vapor which contained sodium? Is it not reasonable for us then to believe that sodium exists in the sun's atmosphere?

By the same reasoning we are able to demonstrate the presence of many other elements in the sun. Iron, for

example, gives 460 bright lines when its spectrum is viewed through a good spectroscope. Every one of these bright lines is exactly matched by dark lines in the sun's spectrum. This could not be accidental. There must be iron in the sun's atmosphere.

Upward of 2,000 lines have been measured and defined in the sun's spectrum, and many of them have been identified with terrestrial elements. We are certain that iron, sodium, nickel, calcium, hydrogen, chromium, copper, and barium exist in the sun's atmosphere—just as certain as we are that they exist in the earth's crust. Gold and silver have not yet been discovered in the sun, but they may exist there, even though their lines have not yet been identified. Helium, on the other hand, was first discovered in the sun's atmosphere, and afterward Ramsay proved its presence in the earth's crust.

It is a comparatively simple matter,

therefore, to determine the composition of a sun, star, or nebula. Even a comet and "shooting star" have been made to tell their story. The light from them is passed through a good spectroscope, the number and position of the dark lines or bright lines noted, and then these lines are compared with the lines of known substances, just as one would match ribbons in a draper's shop.

The presence in the photosphere of the sun of upward of 40 different elements has been determined. The stars, that from the beginning of time had refused to answer all questions, have gracefully yielded up the secrets of their composition, and man has advanced thereby one step nearer to the solution of the mystery of his environment.

And all this wonderful story of the spectrum had been emblazoned upon the sky each time the "magic of the rainbow" glorified the heavens, but man was slow to understand.

DOMESTIC HOT-WATER TANKS HEATED BY ELECTRICITY

A small family in Niagara Falls doing all its cooking by electricity wished to use the current for heating the necessary water for the household as well, and the electric-light company, in making arrangements for such an installation, decided that it would be practical to use the ordinary domestic hot-water boiler or tank already installed. A 750-watt heating unit was inserted in the feed pipe, and the tank was completely covered with a coating of asbestos, 2 to 3 in. thick, to prevent radiation of heat.

The arrangement in the house produced such excellent results that a similar installation was made in a barber shop which was temporarily with-



out a hot-water supply, the hotel in which it was located being closed for the winter. In this case two 750-watt heating units were introduced into the water system.

THE SMOOTH RUNNING OF ENGLISH TRAINS

Money sticks in some pockets and in some hands, but it is doubtful if money could stick long on one of the steps of a fast-moving American passenger train. Indeed, it would in all likelihood be dislodged a few moments after the train started. Yet two instances of coins being dropped upon the footboards of Great Western passenger expresses in England are given as examples of the smooth running of that road.

Both instances relate to the recovery of coins dropped upon the footboards of trains at the moment of departure. In one, a ticket collector dropped half a sovereign (\$2.50) on the footboard of a train running from Paddington station, London, to Birmingham. The

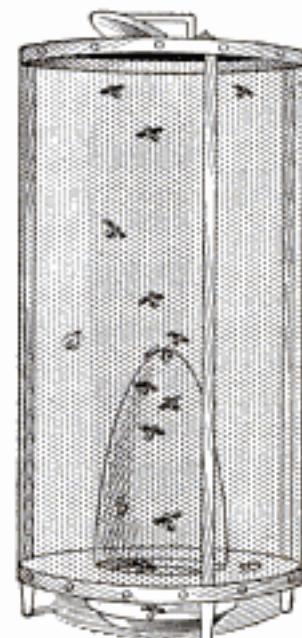
train started away before he was able to pick it up, but the coin was still in position when the train reached Birmingham two hours later. Another coin was similarly recovered when one of the fast trains stopped at Reading after a speedy run from London.

OUT-OF-DOOR TRAP FOR FLIES

The large-sized fly trap here shown is designed to catch flies outdoors, and particularly for service in places near garbage cans, stables, meat markets, grocery stores, and the like. The trap is 26 in. high and 11½ in. in diameter. Some suitable substance, such as a mixture of sugar, water and vinegar, is placed in the dish under the trap, and the flies, after feasting, naturally fly upward, land on the wire dome, and then crawl upward to escape but instead find themselves caught in the trap proper.

URGED TO TAKE EXPLOSIVES FROM THE AIR

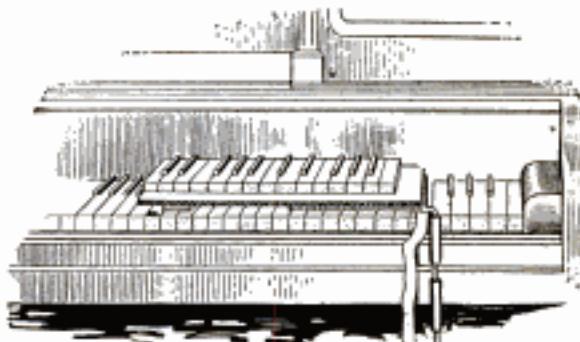
At a recent meeting of the executive committee of the British Science Guild in London an appeal was formulated to urge the British government to take steps to produce explosives from the air, regardless of financial considerations. It was pointed out that explosives were being largely manufactured on the Continent from atmospheric nitrogen, and that England should do likewise, as the sources abroad from which England obtains the raw material for explosives might be cut off in the event of war.



and then crawl upward to escape but instead find themselves caught in the trap proper.

MUSICAL-BELL ATTACHMENT FOR PIANOS

A piano attachment for musical electric bells, designed particularly for



An Arrangement by Means of Which the Pianist may Play Musical Electric Bells

motion-picture theaters and similar places where only a pianist is employed, is just being marketed by a Wisconsin manufacturer. A small keyboard swings into position as shown in the drawing, and by means of it the pianist can operate the musical bells, playing loudly or softly as desired.

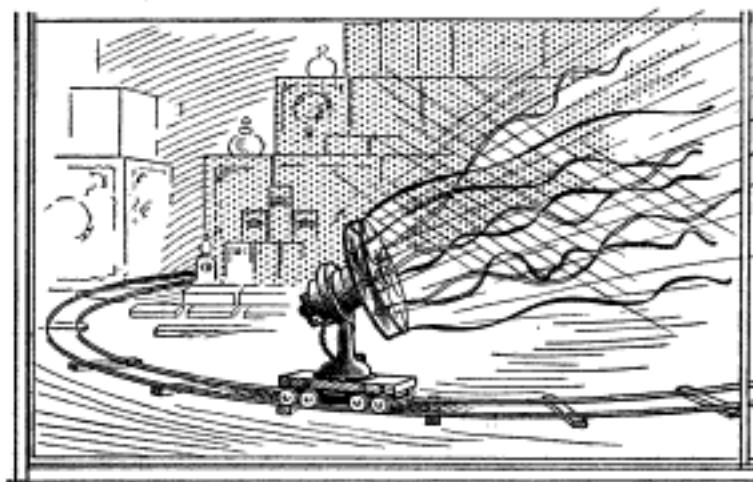
SOLID RUBBER TIRE FOR EMERGENCY

An easily attached solid rubber tire, designed to be used in the place of a pneumatic tire in emergencies, is being marketed by an American concern. It is so flexible as to be easily rolled up for storage in a small space, and, upon damage occurring to a hollow tire, can be quickly clamped on over the rim in its place. It is claimed that with but one regular tire removed, the use of the hard rubber tire in its place will scarcely be noticed, so far as any difference in the comfort of riding is concerned.



AN ELECTRIC FAN WHICH RUNS AROUND A TRACK

The proprietor of a small store in Chicago has devised a novel show-window display of the "action" va-



Electric Fan on Wheels Propels Tiny Car on Tracks around a Store Window, Drawing Power through the Rails

riety with a simple electric fan, a circular track of the type used for the operation of toy trains, and a little truck. The rails of the track are connected into an electrical circuit, which is completed by passing the current from one rail through the truck to the motor of the fan, which is set on the truck, and back to the other rail.

The revolutions of the fan drive the truck around the track.

COWS SHELTER UNDER AN AEROPLANE

A rather unusual scene, incident to an aeroplane accident, was recently witnessed in England. Major Lyle, a pupil of Grahame White, fell with his machine, and although he escaped injury, the aeroplane was wrecked. It was raining at the time, and when the mechanics arrived a short time later to remove the wreck, they found a number of cows sheltering beneath it.

A former sea captain has invented a sea anchor for lifeboats that has an attachment to be filled with oil which can be poured upon the sea.

CONCRETE CHIMNEY OF INTERESTING DESIGN

A concrete chimney recently erected at a steel plant near Hamburg, Germany, has many interesting features besides its great height of 328 ft. Among these are its acid-resisting lining, made absolutely necessary because the purpose of the chimney is to carry away smelter-furnace gases; the special heat-resisting lining which extends from the top of the base to a height of 66 ft., and the massive nature of the chimney's base.

The chimney, which is round in shape, tapers from an outside diameter of 30 ft., at the base, to 11 ft., at the top, where the free opening is 9 ft. in diameter.

Immediately below the chimney proper is an underground vault, 13 ft. in height, which serves as an inlet for the gases. This is octagonal in shape, 36 ft. in diameter, at the base, and 31 ft. in diameter, at the top, and rests on a concrete block, 7 ft. thick and 42 ft. in diameter, which is in turn supported by 237 wooden piles, the space around and between which is filled in with concrete.

The reinforcing of the chimney consists, in part, of forged-iron rings imbedded in the concrete at intervals of about 6 ft. throughout the entire height.

MOTION PICTURES SHOWN ON ELECTRIC PARTY CAR

The new "party car" of an electric interurban railway running out of Pittsburgh, designed especially for theater and other parties who wish a private car, has been equipped with a motion-picture machine, which is operated while the car is making its trip. With the electric lights in the car turned off and the window curtains pulled down, the car becomes a cozy little motion-picture theater on wheels.

When it happens that a party is so large as to require two special cars, half the party occupies the motion-picture car on the outward run, and the other half on the return journey, thus giving the entire party an opportunity to enjoy the pictures.

AN INVENTION FOR THE ASSISTANCE OF MAN

Sets of so-called "twin buttons," designed to take the place of hooks-and-eyes, and safety pins, is a recent



French invention, which, according to a French magazine, should appeal to women and men alike, and especially to such of the latter who have had "prolonged" experience in hooking a woman's dress up the back.

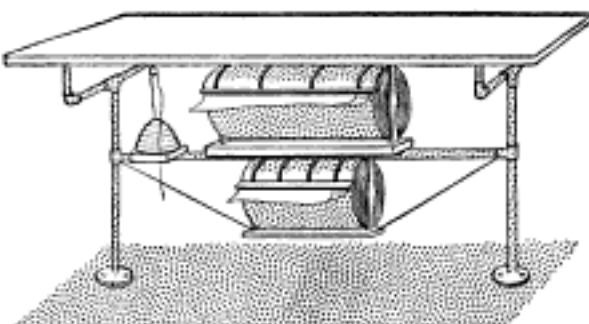
The invention consists of two small pieces of celluloid, provided with holes for conveniently sewing them to a garment, each piece having a snap button and an eye at opposite ends. The sets are attached in such position that the button of each piece engages the eye of the other. They are pressed together in the same way as a glove snap.

The sets are provided in various colors, so that they may be almost invisible when used with thin dress goods of similar colors.

HOMEMADE WRAPPING-PAPER STAND

A homemade wrapping-paper stand constructed by the proprietor of a hardware store in Sioux Falls, S. D., when it was found that the necessary shelf space could not be given up for wrapping, is shown in the accompanying drawing. The frame of the stand is made of $1\frac{1}{4}$ -in. gas pipe, the top, 3 ft. long by 2 ft. wide, being 3 ft. above the

floor. The upper paper-rack brackets are fastened underneath the top by screws, while the smaller rack is bolted

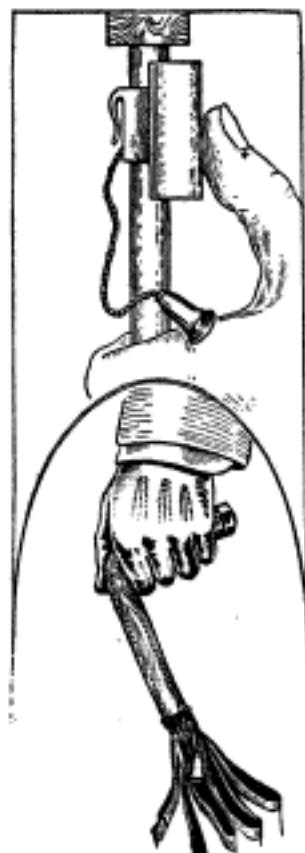


A Practical Homemade Wrapping-Paper Stand

to the cross or tie-rod of the frame, the twine holder being mounted on this cross rod at one end.

RIB GRIP FOR UMBRELLAS

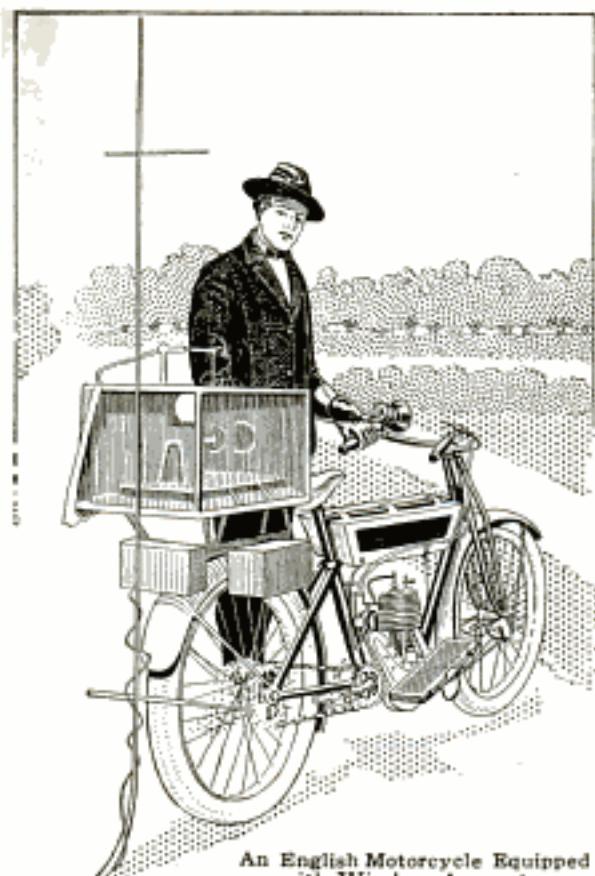
A handy little rib grip for umbrellas is now being manufactured. It snaps onto the umbrella rod instantly, and then the cord attached to it is passed around the rib ends and caught under the hook. It is a practical little device also for a new umbrella, and its usefulness is particularly marked on an umbrella which has had its regular rib-fastening tab torn off during long service.



Among the old ships the Navy Department has on the sales list this year is the "Yankee," the hulk of which lies in Buzzard's Bay, Mass., the sum of \$2,010 having been bid for it, at which figure it will probably be sold.

MOTORCYCLE EQUIPPED WITH WIRELESS

A resident of Nottingham, Eng., who has an enthusiasm for both motorcycling and wireless telegraphy, has



An English Motorcycle Equipped with Wireless Apparatus

equipped his machine with a wireless outfit which does not in any way interfere with the former's operation. The apparatus is mounted on a rack over the rear wheel. The operator, who is G. F. Champion, has succeeded in receiving messages while traveling at a high rate of speed.

ORIGIN OF "HORSEPOWER" AS A POWER UNIT

The multitude of automobiles, motors and power-machinery of all kinds in our days has caused the word horsepower to become part of the daily vocabulary of almost everybody. Nearly as well-known is perhaps the fact that James Watt, the father of the modern steam engine, was the first to measure power by this unit and to establish its

value. But the reason why he happened to consider the work performed by a horse as a power unit instead of some other arbitrary value may not be generally known.

The fact is that one of his first orders for a steam engine was given him by a brewer, with the specification that the engine should be capable of pumping daily at least as much water from a well into the brewery as a horse, the power previously used.

A price was agreed upon and the quantity of water to be delivered had to be fixed. The brewer, a canny Scot, put his strongest horse to work for eight hours, driving him all the time to the limit of his endurance. Thus the horse in that time pumped up so much water, that it, with due consideration of the depth of the well, corresponded on an average to the lifting of a weight of some 30,000 lb. to a height of one foot in one minute. This exceeds by nearly one-third, the work capacity of the average horse, but Watt, knowing with whom he was dealing and desirous to more than fulfill the specifications of the contract, so calculated the engine that it would safely perform 33,000 foot-pounds of work in one minute; and henceforth used this unit, which was called, first in England and then all over the world, horsepower, for measuring the work or power of an engine.

AN INTERESTING FLY-KILLING "GUN"

Although not quite so proficient in number of executions as the "swat-the-fly" type of fly killer, this little Eng-



"Fly Gun" Which Provides Its Own Killing Base

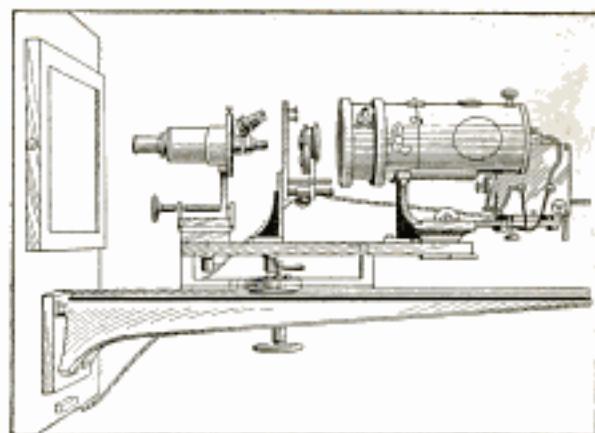
lish device, called a fly gun, is of particular usefulness in certain conditions. It is true that it must be quickly

brought into a fairly exact position in order to kill, while it is only necessary to "swat" with the swatting type of killer, but, on the other hand, the fly gun is provided with its own killing base, which saves the wallpaper, table-cloth or window pane from most of the "spatter" incident to the slaughter.

The upper part or flap of the fly gun is drawn up by a spring, and the pulling of a trigger allows it to descend upon the bottom plate with rapidity and force. The flaps or plates are perforated to prevent air disturbance during the operation.

INGENIOUS PROJECTING MICROSCOPE

A clever projecting microscope, called a projectomicroscope, has recently been installed in St. Bartholomew's Hospital, London, where it is proving of the greatest assistance to the student in the course of his studies. The apparatus consists of an inverted high-power microscope arranged in



This Projecting Microscope Throws an Enlarged Image on a White Screen

connection with a powerful arc light. By its use an enlarged image of the specimen under study is projected on a white screen.

Orders have been issued to place the revenue-cutter service on an efficient war footing and to this end the various ships will be equipped with modern six-pounders and will hold regular target practice.

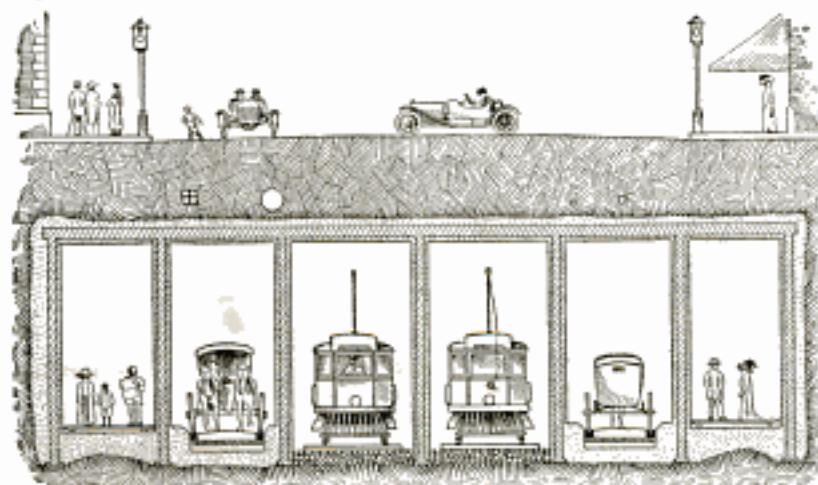
HIGHWAY TUNNEL PROPOSED FOR SAN FRANCISCO

The Devisadero Street Improvement Association of San Francisco has been agitating the construction of a high-

way tunnel under that street to connect the districts known as the "Happy Valley" and "Harbor Hill." The subway proper would be 2,950 ft. in length, and the approaches 2,390 ft. The Panama-Pacific Exposition tract is just one and one-half blocks beyond the north end of the proposed tunnel, so that the project, if carried through, would greatly improve the exposition transportation facilities.

In the tunnel plan a separate section is provided for each kind of traffic in either direction, the footways being provided with moving sidewalks. The vehicle sections would be paved with wooden blocks to give horses a

good foothold and with steel ways for vehicle wheels. The footways would be each 8 ft. wide, the wagon ways 9



Plan of a Proposed Highway Tunnel Connecting Two Sections of San Francisco

way tunnel under that street to connect the districts known as the "Happy Valley" and "Harbor Hill." The subway

ft., and the street-car sections 10 ft. The tunnel would be built on a rather steep grade, giving a difference in elevation of 130 ft. between the two ends.

COUCH HAMMOCK FOR PORCH OR GARDEN

A couch hammock, having no wires, ropes, pegs or posts to fix, and designed for the garden or porch, is



A Simple Folding Couch Hammock

shown in the accompanying drawing. It folds flat when not in use, and opens as simply as a folding chair. The head can be either raised to form a lounge or lowered to form a bed.

LOCUSTS MENACE SPANISH AIRMAN

While flying at the Bajo aerodrome, near Madrid, an airman named Jean Mauvaise flew into a cloud of locusts which nearly caused his death. With the mild winter and spring at 96 deg. F., in the shade, locusts have become prevalent in Spain, and when at a height of 60 ft., the aviator met an invasion of these insects in the air, causing the aeroplane to fall. Mauvaise is said to have had a miraculous escape, but his machine was wrecked.

FRANCE AIMS BLOW AT ADVERTISING SIGNS

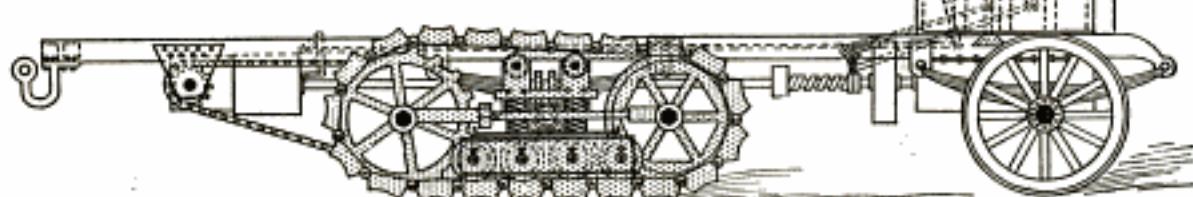
The French government has inaugurated a scheme for the suppression of advertising signs which does not depend upon prohibitive legislation, but prohibitive rentals.

During the past two years billboard advertising has become so popular near Paris that it is now difficult to obtain an uninterrupted glimpse of country on any of the roads leading out of the city. Only a small tax has been levied on such boards in the past, but the government has now increased the tax to a figure which is expected to prove prohibitive. In the future a little more than \$3 will be charged per square foot on boards of less than 18 ft. square, \$13 per square foot for boards of from 30 to 60 ft. square, and \$18 per square foot for boards of still larger size. This tax is to be doubled if the board contains two advertisements, trebled if there are three, and so on.

CATERPILLAR-DRIVE ARMY TRUCK

The caterpillar form of automobile, which has been described in this magazine several times, and in which the machine virtually lays its own track as it moves along and then runs over it, is recommended by Lieut. B. F. Miller, U. S. A., as the type of service truck most nearly approaching the requirements of the army.

The recommended type of machine, however, as described in a recent issue of Motor Age, differs a little from other caterpillar.



Caterpillar Truck Suggested by Lieutenant Miller, U. S. A., as Ideal for Military Service

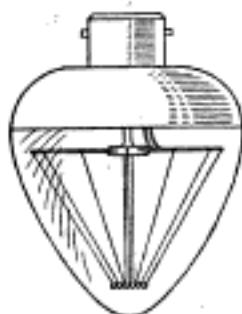
vehicles in that it is provided with an ordinary set of wheels in front. The arrangement is such, however, that the steel-rimmed front wheels are intended simply for steering and for carrying the weight of the engine, which is located over them. The transmission is located back of the rear axle.

LEAD-COATED STEEL FOR ROOFING

A new type of metal roofing, consisting of sheet steel, coated with pure lead, is claimed to have many advantages over other similar types of roofing. Among the claims set forth are, that it is not subject to cracking or flaking; that it is not readily susceptible to chemical influences, and that it will not resist painting as does a zinc surface. It can be painted without the use of acids, may be easily soldered, and is not liable to rust.

NEW FORM OF METAL LAMP FILAMENTS

With a view to obtaining a better natural downward distribution of light than is possible in the ordinary metal-filament electric lamps, without the use of shades or reflectors, a European inventor is constructing lamps in which the filaments form the envelope of an inverted cone.



The results of comparative tests between the new type of lamp and one in which the filaments were of the ordinary cylindrical shape is claimed to have shown a 20-per-cent superiority for the conical form.

The submarine boat "Seal" in a government test was submerged to a depth of 256 ft. and remained at this depth for a period of 31 min., rising promptly to the surface at the end of that time.

MEAT CHOPPER OPERATED BY MOTORCYCLE

Motorcycles have often been harnessed to small machines in times of emergency, such, for instance, as when the electric power fails for a few hours or days, and it is also quite probable that they are sometimes used as the



Motorcycle Harnessed to a Meat-Chopping Machine

regular power plant for such machines. An instance of regular instead of just emergency installation of a motorcycle as a power producer is here illustrated. The proprietor of a butcher shop in Chicago has been using his motorcycle for the past year to operate a meat-chopping machine. He also uses the motorcycle for business trips about the city and suburbs, and finds that the arrangement cuts down his operating expenses materially.

AN UNUSUAL ICE CRYSTAL

An unusual, if not unique, snow or ice crystal (not to be confused with a snow flake) was found by a correspondent to the French scientific magazine *La Nature*, during a trip through the Pyrenees. Its peculiarity is not in the shape, which is the regular hexagonal of all such crystals, but in the exceptional thickness, which exceeded half the diameter of

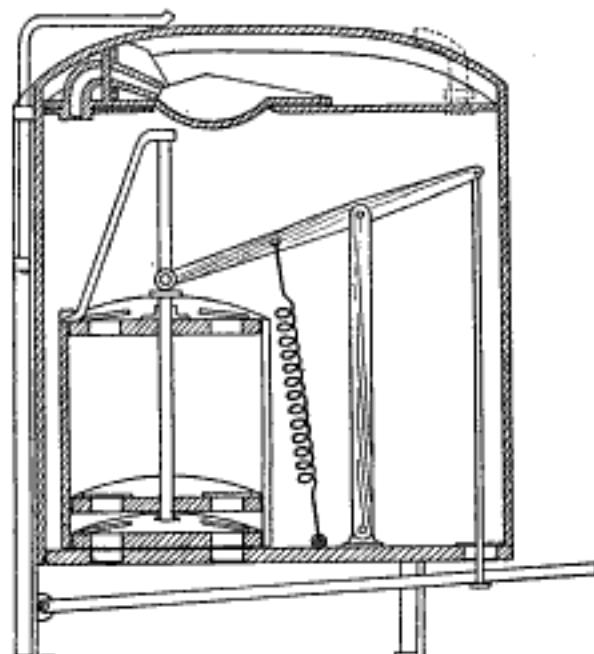


its surface. An ordinary ice crystal is so extremely thin that it melts instantly on being touched by a finger.

The unusual crystal was found at an altitude of about 5,000 ft., the temperature at the time varying between 23 and 27 deg. F.

CYLINDER-BLAST FORGE OF PORTABLE TYPE

A portable forge with a blast produced by a piston operating in a cylinder has been patented by an Eng-



A Portable Forge with a Blast Produced by a Piston Working in a Cylinder

lish inventor, who claims that the large volume of air thus compressed in the reservoir makes the blast much more even than in forges operated by bellows only. Within the body of the forge, which is the compressed-air reservoir, is the compressing cylinder and piston. When the pedal is pressed downward by the foot of the operator the piston in the cylinder is raised, causing air to be sucked in through flap valves in the bottom. When the pressure on the pedal is released, the spring draws the piston back to the bottom of the cylinder again, and continuation of the operation causes a pressure to be set up within the reservoir.

AUTOMATIC ELECTRIC MINE LOCOMOTIVES

An electric storage-battery locomotive, entirely automatic in operation, has been in use for some time in a German coal mine and is said to have given excellent results as to simplicity, economy of operation, and safety.

The most interesting feature of the installation is the device which almost instantly stops the locomotive when an obstacle on the track is encountered. This device consists of a wooden frame mounted on the front of the locomotive in such position that it will come in contact with any object lying on the track. When the frame strikes an obstacle, such as a man, for instance, the frame slides backward, breaks the electric circuit and causes the brakes to be applied, thus bringing the locomotive to a quick stop. When the obstacle is removed, the frame is forced forward again by a spring mechanism, the brakes are released, the circuit closed, and the locomotive moves on again. The frame is removable and can be mounted at the rear when the locomotive is running in the opposite direction.

The switching of the locomotive is also automatic, and is accomplished by means of rings attached to brackets mounted on the front. Each switch lever is provided with a crossbar which will engage with the ring carried by a certain bracket. If the ring is not on the bracket, the particular switch it serves is passed over without being actuated; but if the ring is in position, the crossbar is engaged and the switch thrown.

The locomotive weighs $2\frac{1}{2}$ tons, and travels at a rate of about $3\frac{1}{4}$ miles an hour.

The greatest depth of the sea that has yet been measured was reported by the survey ship "Planet" to be at a point 40 miles off the northern coast of the Island of Mindanao, one of the Philippine group, where a depth of 32,089 ft. was registered.

THE PROPOSITION TO CERTIFY OYSTERS

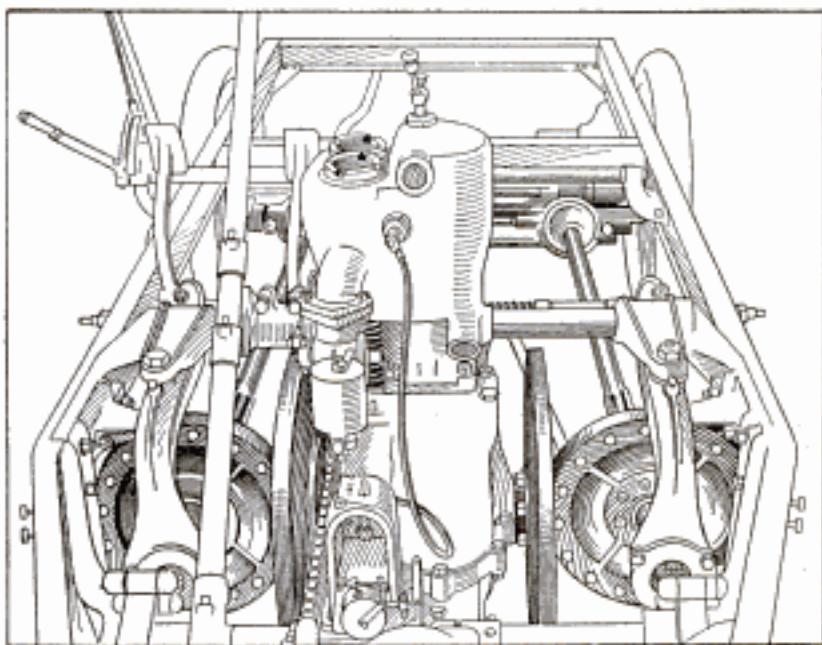
All the oyster fisheries in this country have been urged by Dr. W. T. Sedgwick, of the Massachusetts Institute of Technology, to work for an arrangement by which all oysters would be "certified," the certification to be made by a board of health or other authority.

According to this plan there would be three grades of oysters, only oysters in the shell being in the first grade. The second grade of oysters, although not of the highest quality, could be eaten raw as well as cooked, and the third grade, although fairly suitable for food, however prepared, should be marked "for use only when cooked."

The "Lusitania" and "Mauretania" now have two captains each, one being a "staff captain" who relieves the captain-in-chief of much of his work without further burdening the first officer or mate.

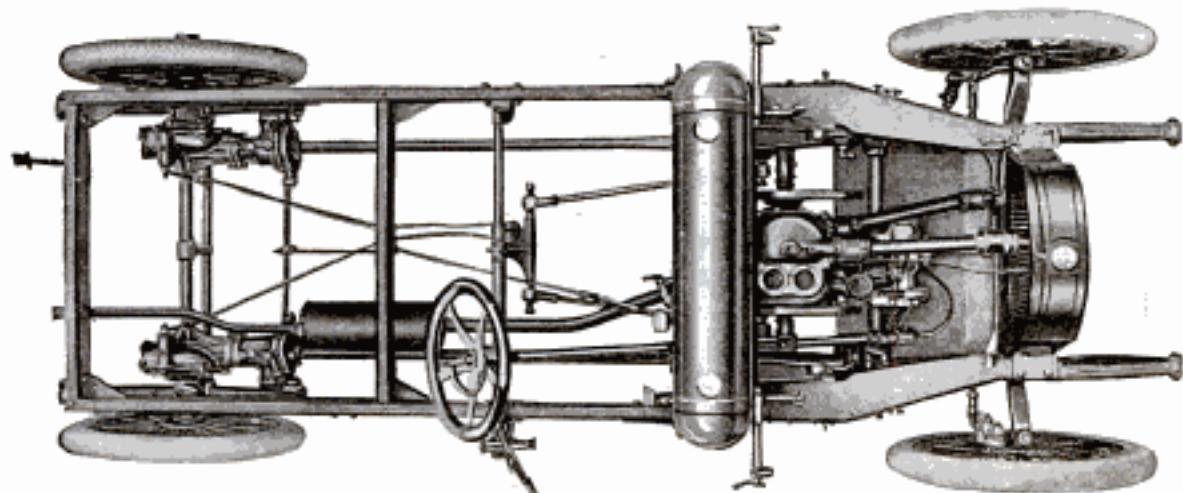
NEW IDEA FOR MAKING CHEAP AUTOMOBILE

A very clever innovation in automobile design, for the purpose of creating a type capable of being built at



Front View of the Power Plant of New Automobile, Showing the Two Flywheels, with the Friction Disks Pressing against Them

exceedingly low cost, is being tried in France. The essential novelty in this car is best shown in the top view of the chassis, in which it is seen that the final drive is by two propeller shafts extending to two bevel-gear pairs on extensions of the rear-wheel hubs. The forward ends of the propeller



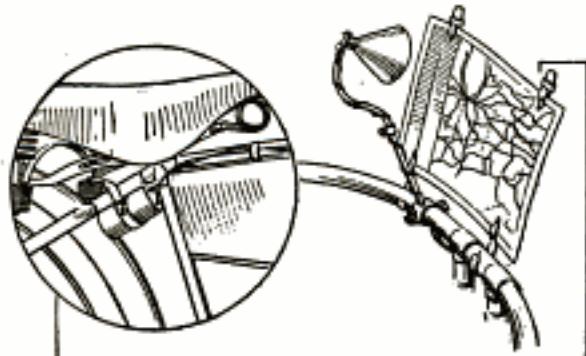
Top View of New Cheap Automobile, Showing the Separate Propeller Shafts for Each Rear Wheel Which are Driven by Friction Disks Pressing against the Two Flywheels

shafts are directly driven by friction disks that press against the smooth surfaces of the two flywheels, one on each side of the one-cylinder vertical engine.

All changes of speed, as well as the reverse, are readily produced by sliding the friction disks forward or backward by a simple controlling device.

ILLUMINATED ROUTE CARD FOR MOTORCYCLES

After all, it is at night that the route card is most necessary and valuable to the motorist and motorcyclist, and



Route-Card Illumination on a Motorcycle

the night use of such guides requires illumination. At the start of a recent motorcycle run from London to Edinburgh several interesting fittings were to be seen on some of the machines, and among them was a route-card holder mounted on the handlebars, and a neat little electric lamp so mounted as to illuminate the card. A small dry battery under the seat supplied the current.

UNCONNECTED ELECTRIC WIRES GIVE SHOCK

A group of telegraph wires on the railway station of Clichy-Levallois, at the gates of Paris, gave severe shocks to a number of electricians who touched them, although these wires were not yet connected with any system.

The phenomenon was so strange that the matter was reported, and the subsequent investigation revealed the

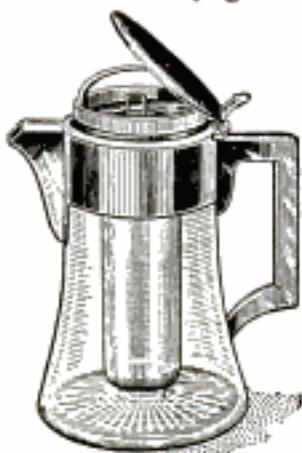
startling fact that the shocks were due to Hertzian waves sent out from the powerful wireless station at the Eiffel Tower. A receiving station was then established by way of a test, and the wireless messages dispatched from the tower and other stations were intercepted. This proved that the group of wires, through pure hazard, filled all the conditions of height, distance and position necessary to receive the Eiffel Tower's communications. This was considered particularly interesting because a wireless tower erected on the roof of a normal school in the vicinity had never succeeded in intercepting these messages.

NUMBERING OF FARM HOUSES SUGGESTED

If the plan of the Automobile Club of Kenosha, Wis., is worked out as expected, all the country roads in the vicinity will be named and blocked off in distances of certain length; and every farmhouse or farm will be given a number. These names, numbers and distances will be made available by the publishing of a guide map. Automobile and other vehicle travel in Kenosha County will thus be greatly facilitated and it will be as easy to find a farmhouse as it now is to find a city residence.

CHAMPAGNE JUG WITH ICE CHAMBER

Champagne cooled in a jug or pitcher, instead of inserting the bottle in a bucket of ice, is one of the numerous articles advertised as suitable for wedding gifts by a large London shop. The ice is contained in a central chamber, and the jug is of crystal glass ornamented with silver mountings.



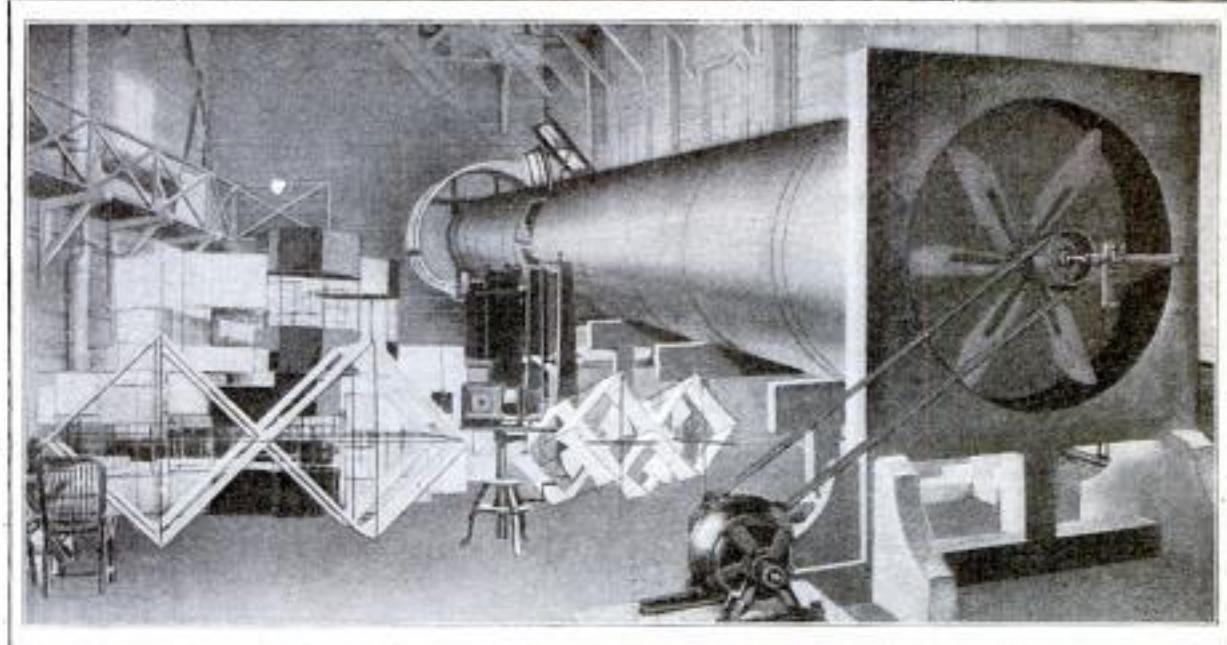


Fig. 1—Wind Tunnel of the Aerodynamic Institute at Koutchino, Russia

EUROPEAN AERONAUTICAL LABORATORIES

By DR. A. F. ZAHM

Chairman of the Aerodynamic Committee of the Aero Club of America

There is in America a strong and general sentiment favoring the establishment of a national aeronautic institute commensurate with the best in Europe. For it is noted that exhibition and prize flying, however munificently rewarded, have but disclosed the limitations of our aeroplanes, not the science of perfecting them. The cut and try, the rough pioneer work, has been cleverly performed by our chief aero inventors, and is practically terminated.

The art of mechanical flight has now to be placed on a rational, an exact, an engineering basis, through investigation of the correct principles of design, and by rigorous tests of actual machines and their accessories. These ends can be attained best in institutions specifically arranged for the purpose, and adequately endowed. We have, in fact, either to resume in America the kind of investigations abandoned by Dr. Langley, for want of funds, or borrow from other nations their exact science of aeronautical engineering. The feeble and fortuitous experiments of our amateurs, pottering in poor laboratories, can not keep us abreast of

the more enterprising countries. We may therefore with profit glance at the chief foreign establishments for an intimation of what is needed at home.

The institute here contemplated is primarily for producing rather than teaching aeronautical science. Schools of aviation are already training aviators; courses of aeronautical engineering, though popular in Europe, are at present not greatly needed in America.

In Europe two kinds of aeronautical-research institutions are in active operation; the one kind privately endowed and managed in the interest of science and the art of construction; the other kind supported by governmental appropriation, and conducted largely in the interest of the military service, though frequently publishing valuable data which may be available to the world at large. We may devote our attention at present to the private and civil institutions, since their status and operation have been more fully made public.

Near Moscow, in Russia, is the celebrated Institut Aerodynamique de Koutchino, under the directorship of

D. Riabouchinski, established by him in 1904 at a cost of 100,000 roubles and provided with an annual income of 36,000 roubles, or about \$18,000. This laboratory is intimately coördinated with the University of Moscow, and is devoted to the greatest variety of investigations in pure and applied aerodynamics, meteorology and aeronautics generally.

The personnel of the institute comprises a group of competent scientific men and skilled mechanics. Dr. Riabouchinski, a patron of aeronautics both wealthy and versed in the science, is the leading spirit. With him is directly associated Mr. Kousnetsov, assistant director. There is a business manager, an assistant manager, a computer and a librarian. Prof. Joukovski, of the University of Moscow, an honorary member of the above scientific staff, agreed to make a theoretical study of a part of the experiments, and his students were encouraged to conduct researches in the laboratory at Koutchino. In the workshops are nine skilled mechanics and six laborers.

The institute comprises four buildings surrounded by ample grounds in the open country. There is a commodious dwelling and office building for the technical staff, a dormitory for the workmen, a main laboratory and a power house. The main laboratory is a two-story building measuring about 50 by 115 ft., and having at one corner

a tower 65 ft. high; it comprises an ample machine shop and carpenter shop well furnished with hand tools and power tools, various minor rooms, and a large two-story experimental room. This latter is equipped with a wind tunnel (Fig. 1) and sundry measuring apparatus mostly constructed at the institute. The power house is a one-story structure measuring about 35 by 60 ft.; it comprises a boiler, dynamo and engine room, an accumulator room, and a forge room.

The original program of investigations comprised three principal sections. The first section, devoted to studies of air resistance, included determinations of coefficients of resistance of various shapes; determinations of the center of pressure on various models; determinations of the lift, tractive force and stability of models in flight, etc. The second section, devoted to practical applications of the laws of air resistance, included the construction and test of helicopters, kites and aeroplanes of various types; the lifting of loads, signaling

and photographing by means of kites, etc. The third section was to be devoted to the scientific exploration of different strata of the atmosphere. The program has been carried out with great skill and care. The results are published in excellent form, from time to time, in the elegant bulletins of the institute.

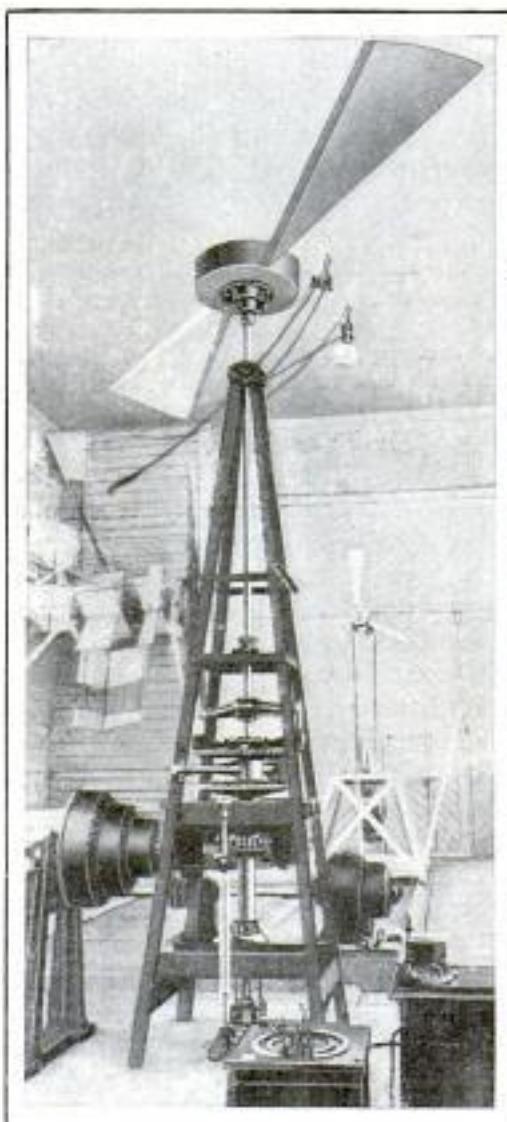


Fig. 2—Propeller-Testing Apparatus of the Aerodynamic Institute at Koutchino

In Germany a well equipped aerodynamical laboratory, endowed with an income of \$7,000 per year, has been established at the University of Göttingen, and has been in practical operation for three or four years. It is under the direction of Prof. Prandtl, who holds the chair of aeronautics in the university. He is assisted by various private lecturers, and has as technical advisers men prominent in mathematical and physical science and engineering. The endowment was furnished primarily by private individuals, and has been supplemented by governmental appropriation. It may be remarked that the sum of \$7,000 a year in Germany has the purchasing power of almost twice that amount in America.

The experimental laboratory of the Göttingen establishment, apart from the constructional and executive departments, is a one-story building, in size about 30 by 40 ft., comprising a wind tunnel and two rooms, one for desk work, the other for instrumental observations. The wind tunnel of the laboratory, consists of a continuous closed channel, two meters (6.56 ft.) square in cross section and as long as the building. Through this tunnel the air is forced in steady closed circulation by a screw ventilator about 6.5 ft. in diameter, actuated by an electric motor of 30 hp. A wind speed up to 10 meters (32.8 ft.) per second is thus available when the motor is running at half load.

In order to insure perfect uniformity of flow in the air stream all over its cross section, special guide and equalizer surfaces were devised. At each bend of the stream a number of turbine-like blades divert the air gently

through 90 deg., thus obviating the whirlpools which would otherwise occur. On leaving the ventilator the vexed and turbulent stream passes through a sheet-metal "honeycomb" (Fig. 3), comprising 400 cells, each about 4 in. square by 20 in. long. Later it passes through a second "honeycomb," comprising 90,000 cells proportionately smaller in section and about half a foot in length. Thus ironed out, the air flows in a steady uniform horizontal, rectilinear current through that portion of the tunnel where models are to be inserted to have their resistance investigated.

With this equipment the technical staff of the laboratory has made many important investigations. The lift and resistance of inclined-plane and arched plates have been measured at many angles of incidence, and with various ratios of length to breadth of surface. The effect of rounding and sharpening the front and rear edges of such plates also was studied. The vertical action of the aeroplane wake on the rear horizontal rudder was investigated. The resistance of wires, cords

and ropes likewise has been measured at various wind speeds up to 10 meters (32.8 ft.) per second.

Perhaps the most interesting of the early researches in the Göttingen wind tunnel pertain to hull forms, or "balloon models," as they were called. Various torpedo-shaped copper shells, formed by electrodeposition, were suspended by fine wires in the uniform air blast, to determine their resistance. Then as successive holes in the shell from prow to poop were solitarily opened, the internal pressure of the shell was measured with a delicate

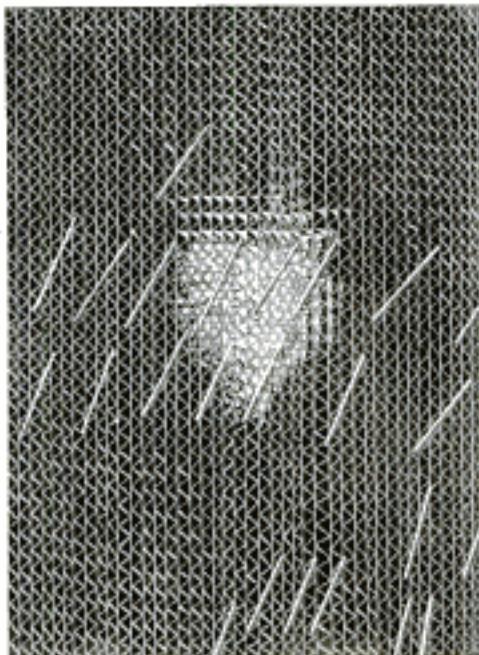


Fig. 3—Honeycomb Sections of the Göttingen University Wind Tunnel, Which "Iron Out" the Wind, the Irregular Strips Correcting Inequalities

gauge. Thus the external surface pressure at each hole became known. Summing the local pressures all over the model gave the entire resultant

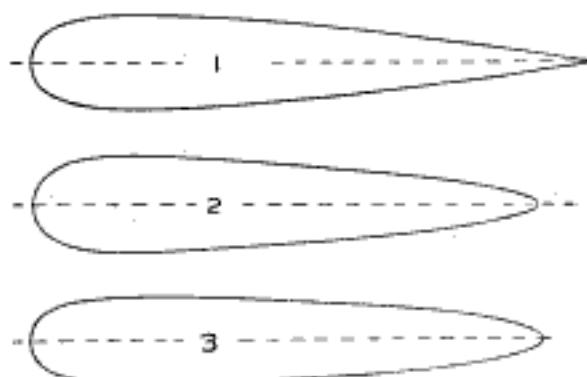


Fig. 4—Hulls of Easy Shape Tested in the Göttingen University Wind Tunnel

wind pressure, independently of the air friction along its surface. Subtracting the resultant wind pressure from the whole wind force on the model gave the resultant wind friction.

Of the models investigated, and shown in Figs. 4 and 5, the form of least resistance, for moderate wind speeds, is the whale-shape, No. 4. Next in order of efficiency are 6, 5, 1, 3, 2. The pressure at each point of a longitudinal line of model 6 is shown in Fig. 6, where positive wind pressures are indicated by distances above the axis of the figure, negative pressures, or suctions, by distances below that axis. As both prow and poop show positive

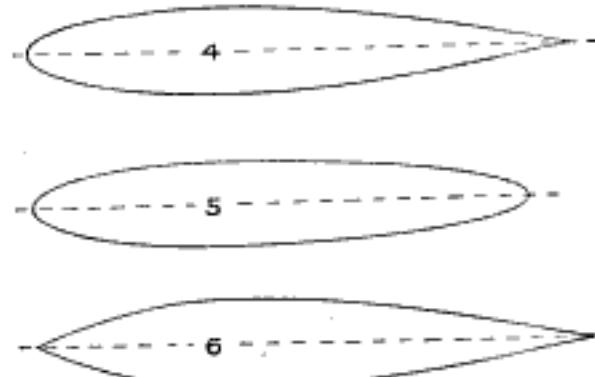


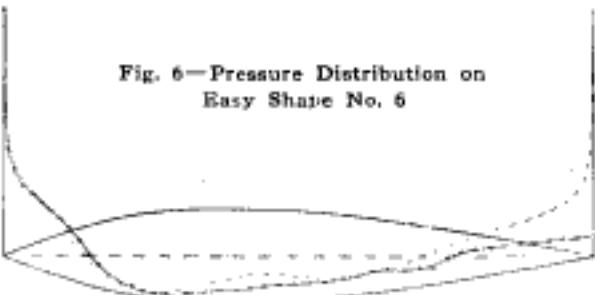
Fig. 5—Other Hulls of Easy Shape, No. 4 being the Shape of Least Resistance

pressures, the model is manifestly resisted in front and boosted behind. The suction exerts a propulsive effort be-

fore the major section, a retarding effort behind. The most efficient shape, 6, has at the higher speeds given about $1/18$ the resistance of its major circle exposed squarely to the wind. In the interest of rapid transit, these researches should be extended to speeds exceeding 100 miles an hour.

In France, Mr. Basil Zaharon has given \$140,000 to found a chair of aeronautics in the University of Paris, and Mr. Deutsch de la Meurthe has donated to the University the Institut Aerotechnique de Saint-Cyr, Fig. 7, near Versailles, founded at a cost of \$100,000, and endowed by him with an income of \$3,000 a year for maintenance. The establishment was ready to begin active operations in July, 1911. Its director is M. Maurain, Doctor of Sci-

Fig. 6—Pressure Distribution on Easy Shape No. 6



ence, and former professor in the faculty of sciences of Caen. He has on his advisory committee many of the most eminent scientific and aeronautical experts in France together with prominent representatives of the University of Paris, the Aero Club of France, and various civil and military departments of the government.

The institute comprises nearly 20 acres of clear, dead-level land adjoining the maneuver ground of the government military school, at a convenient railway center a few miles from Paris. Some 12 acres are reserved for buildings; the rest forms a narrow strip 4,400 ft. long containing an electric road (Fig. 8) for transporting models at various speeds when studying their resistance in free air.

The first structure erected is the main building which measures over all some 260 ft. long by nearly 200 ft. wide. This has a main testing hall over 60 ft.

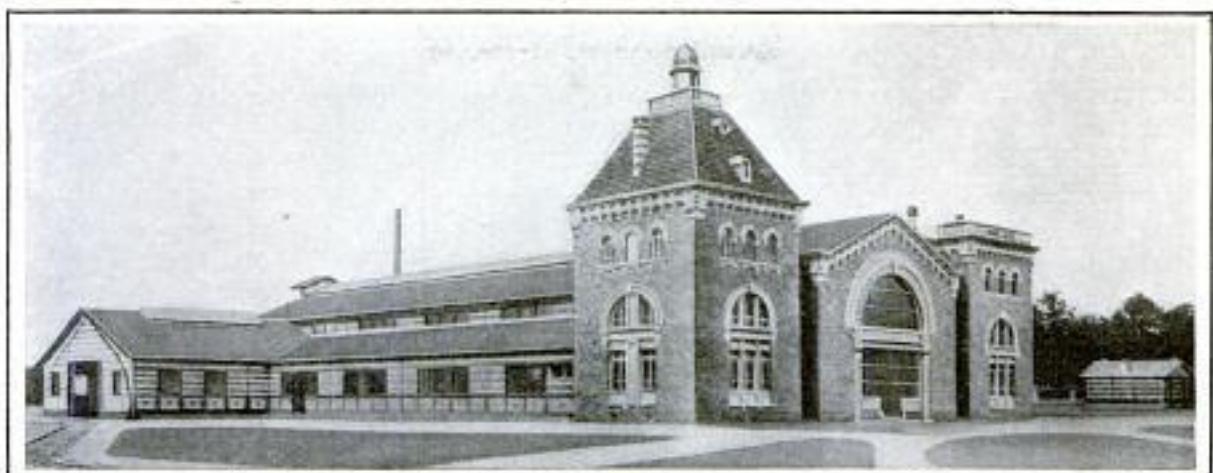


Fig. 7—General View of the Aerotechnical Institute at Saint-Cyr, France, Founded by Deutsch de la Meurthe

wide, running nearly the full length of the building, and having grouped about it the store rooms, workshops, power plant, chemical and physical laboratories, etc. Two large square towers on the front corners of the structure, three stories high, serve as headquarters for the administrative and technical staff, together with the library, drafting room, museum, etc.

Among other buildings in the original plan are dwellings for the persons in charge, and a large roundhouse one story high. The roundhouse, which measures nearly 120 ft. in diameter, was designed to shelter a whirling table, the extremity of whose whirling arm was to describe a circle some 300 ft. in circumference and carry various models subject to aerodynamic study. This can be used in any weather, while the electric road can be used only at special times, and mostly during fair and extremely calm weather.

The character and scope of the work of the Aerotechnical Institute are all that can be desired. Both governmental and commercial, both private and institutional investi-

gations and tests are conducted. The results are made public or kept confidential as desired by the persons immediately concerned. Apparently, therefore, it meets all the needs of thorough science and practical industry.

Prior to Deutsch de la Meurthe's munificent endowment, another wealthy and liberal patron of science in France, G. Eiffel, the famous builder of the Eiffel Tower, won renown for his country and himself by elaborate researches in aerodynamics made at his own expense, and with the aid of two capable engineers associated with him. He first determined the resistance of bodies falling from the tower through still air; then he studied the behavior of models held in moving air in a wind tunnel of his design. From the ex-

perience so acquired, he, in 1912, built an entirely new aerodynamic laboratory containing two wind tunnels, a large and a small one, in which to prosecute with better advantage his splendid investigations.

This maturer type of the Eiffel wind tunnel is shown in Fig. 9. A screw suction fan, driven by an

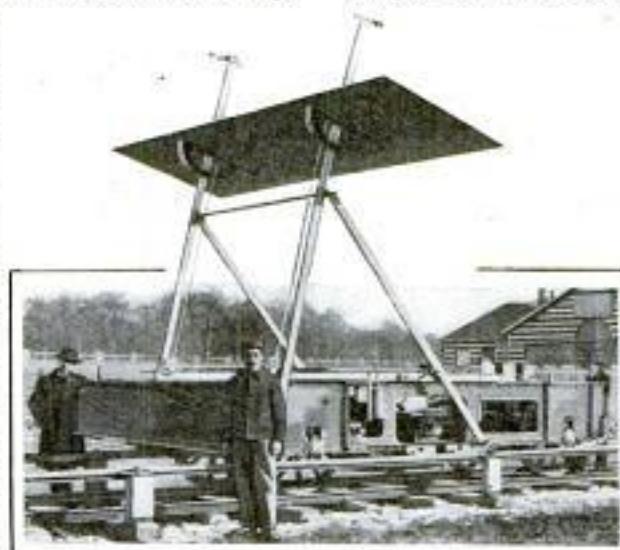


Fig. 8—Electric Car for Air-Resistance Measurements, Aerotechnical Institute at Saint-Cyr

electric motor, causes air to flow through the long tube, as shown by the arrows, and to return on its out-

an interesting evolution from the experience of Eiffel and his predecessors in aerodynamic research.

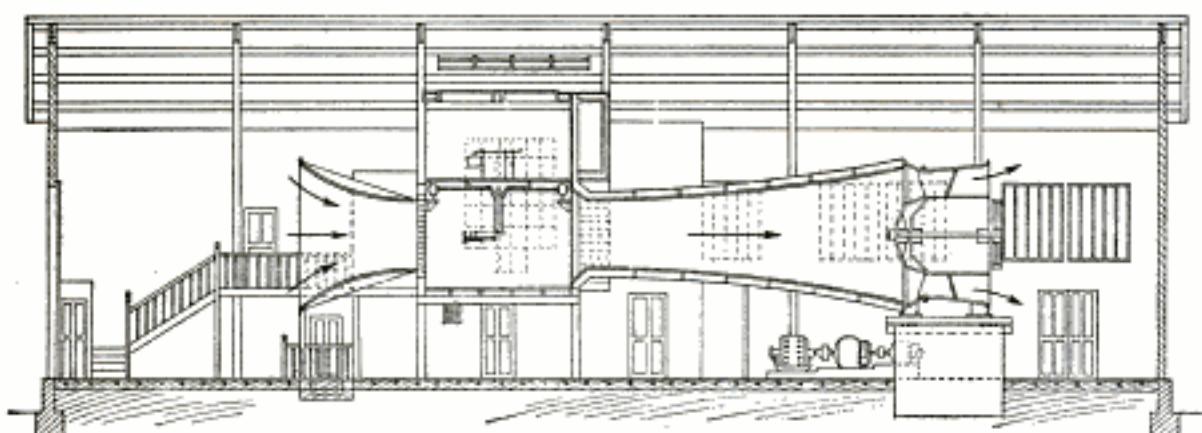


Fig 9—Longitudinal Section of Eiffel's Wind Tunnel, the Course of the Wind being Shown by Arrows; the Little Black Figure in the Center Chamber being the Model Which is to be Tested

side in symmetrical flow through the room containing the tube. The current enters the tunnel by a large conical mouth containing a "honeycomb" partition at its smallest section, passes, in smooth and uniform stream, through the honeycomb into an experimental chamber, thence into the exhaust cone as seen in the illustration. Thus, for reasons that are obvious, a continuous closed circulation is maintained at a minimum cost of motive power. The models to be studied are placed in the wind stream where it emerges from the honeycomb. Their lift, their resistance and their center of pressure are determined by

With an equipment similar to this, Eiffel and his engineers made many important investigations, particularly on plane and arched plates set at various angles to the current. Figure 10, for example, shows the distribution of pressure found on a wing shape at the angles of incidence shown. The lines projecting downward from the under surface indicate the intensity of the wind pressure at those points, while the lines projecting above the upper surface indicate the intensity of suction. The pressure or suction at any point was found by perforating the surface there, and connecting the interior of the perforation with a delicate

manometer. The negative figures indicate suction intensities. By summing the point pressures so found, the resultant pressure could be determined in both magnitude and position. The particular diagrams here given show that the lift of such a wing is due much more to suction above than to pressure beneath its surface.

Similar diagrams were obtained for a great variety of wing forms, and happily enough it was found that from the study of such models in the laboratory the behavior of full-size aero-

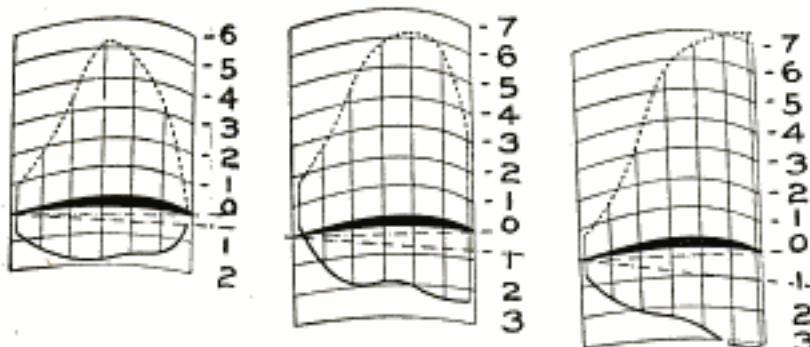


Fig 10—Pressure Distribution on a Wing Shape at Various Angles of Incidence, as Found by Eiffel by Means of Wind-Tunnel Studies

a special balance which supports them during an experiment. The pressure at every point of their surface is measured as explained in describing the Göttingen laboratory. This tunnel is

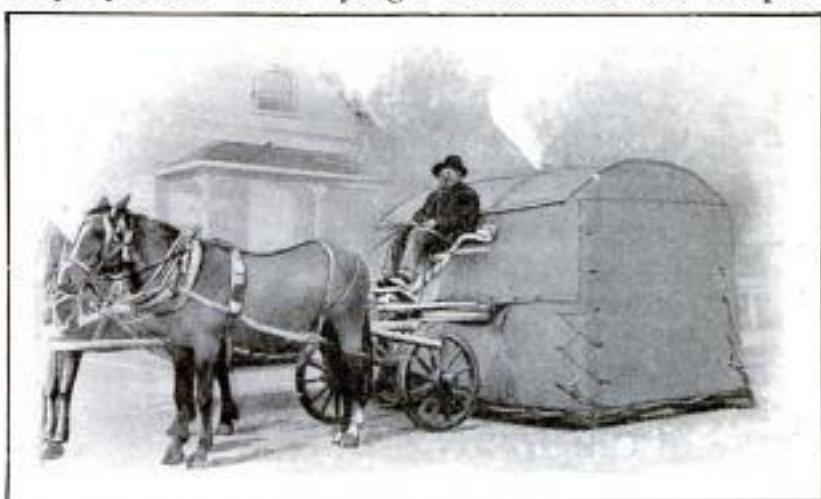
planes can be accurately predicted. Well equipped aerodynamical laboratories similar to those heretofore described, but in governmental service, have been in operation for some years in Italy and England, the former as a part of the military establishment, the latter as a part of the British National Physical Laboratory. Space will not permit an account of them in this article. But enough has been said to indicate the liberal and serious nature of the aeronautical laboratories of Europe. America is the only first-class nation without

an aeronautical institute. It is to be hoped that when the American Aeronautical Institute is finally established, its endowment will be commensurate with the wealth and population of our country, and that its contributions to aeronautical science will rank with the splendid achievements of our pioneers in the practical development of aviation. The founding of such an institute, or one laboratory thereof, should appeal to any lover of mechanical science who would establish a monument of great permanent value to his country, and worthy to perpetuate his name.

ICE FLOES AS REFUGE FOR "TITANIC'S" PASSENGERS

It seems incredible, according to the Hon. P. T. McGrath, a member of the legislative council of Newfoundland, that in all the multitude of people on the "Titanic" no one thought of the ice floes as a means of saving all on board. There is widespread regret among the hardy fisher-folk of Newfoundland that this, to them, obviously simple and effective method of saving all on board was not utilized. Their idea is that the ice floes could have been used as gigantic rafts, the boats being used to convey passengers and crew to them, to remain until rescue ships arrived.

The idea is one, says P. T. McGrath, that would have immediately commended itself to a Newfoundlander, and it is one that has already won historical recognition. He here refers to the famous ice-floe journey of the survivors of the Arctic steamer "Polaris," who, in April, 1873, were picked up from an ice floe on the Grand Banks after drifting six months and covering 1,600 miles.



The Canvas Housing on the Rear of the Street Sweeper Keeps the Dust from Flying

rescue ships

CANVAS HOUSING ON STREET SWEEPER

The street sweeper used in Klamath Falls, Ore., is provided with a rather unusual housing to prevent the dust from flying. Built around the rear por-

tion of the machine, wheels and all, is a light framework covered with heavy canvas. The canvas drops close to the surface of the road, and effectively confines the dust, even when the machine is used on absolutely dry streets.

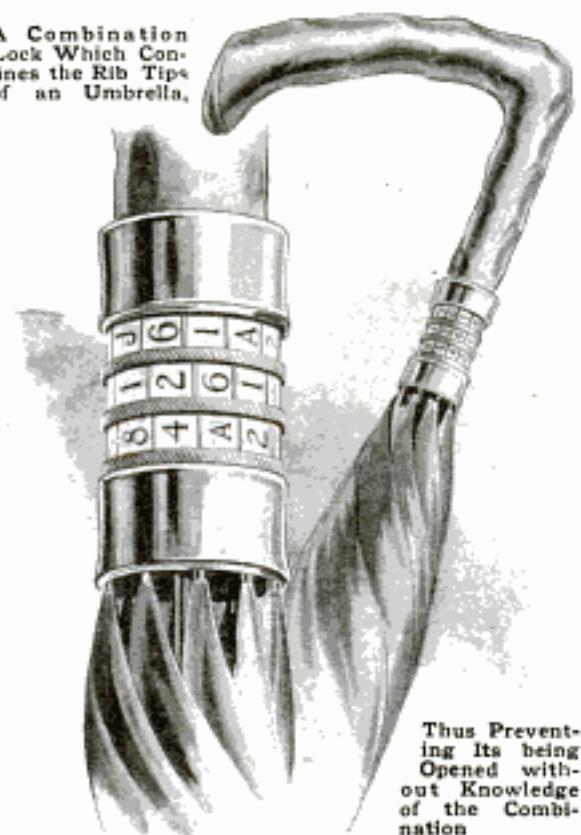
Incubators are used in South Africa not only in raising ostriches, but for hatching alligators, the latter being bred in large numbers to supply the demand for alligator hides.

COMBINATION LOCK FOR UMBRELLAS

An umbrella made thief-proof by being locked in such manner that it cannot be opened has been invented by a coat-room attendant of a London cafe. That it will really keep an umbrella from being "borrowed," however, is to be questioned, for, as is shown in the series of illustrations, it is very likely to be taken and then, when the borrower finds he cannot open it, dropped disgustedly in the street, which does not preserve it for the owner.

The locking device consists of a metal collar, one end of which may be slipped down over the rib tips, and is securely locked to them by revolving the three metal rings. These rings bear the letters and numerals of the secret combination.

A Combination Lock Which Constrains the Rib Tips of an Umbrella.



Thus Preventing Its Being Opened without Knowledge of the Combination

USING THE OLD AUTO PIECEMEAL

How to put to practical use the parts of an old automobile has been ingeniously worked out by an Oregon man on his country place, according to a description given

in Motor World by a visitor who was astonished at some of the results. In the living room a "lazy seat" of peculiar shape but obvious comfort turned out to be the tonneau of the old car. The leather of the seat was almost as good as new, the upholstering deep, and the settee was very roomy and inviting.

In his incubator house was a hot-water radiator which supplied the necessary heat in winter so that the heating within the incubators should not be too difficult, and this radiator was another part of the old car, the engine radiator connected up by pipes with the hot-water system of the house kitchen.

The old four-cylinder motor was set up in the basement and connected with a little dynamo, developing enough power to light the whole house. In order to obviate the necessity of running the motor and dynamo continuously, the owner had installed four accumulators or storage batteries which furnished the lighting current direct, and only needed occasional charging by the dynamo—an economical arrangement.

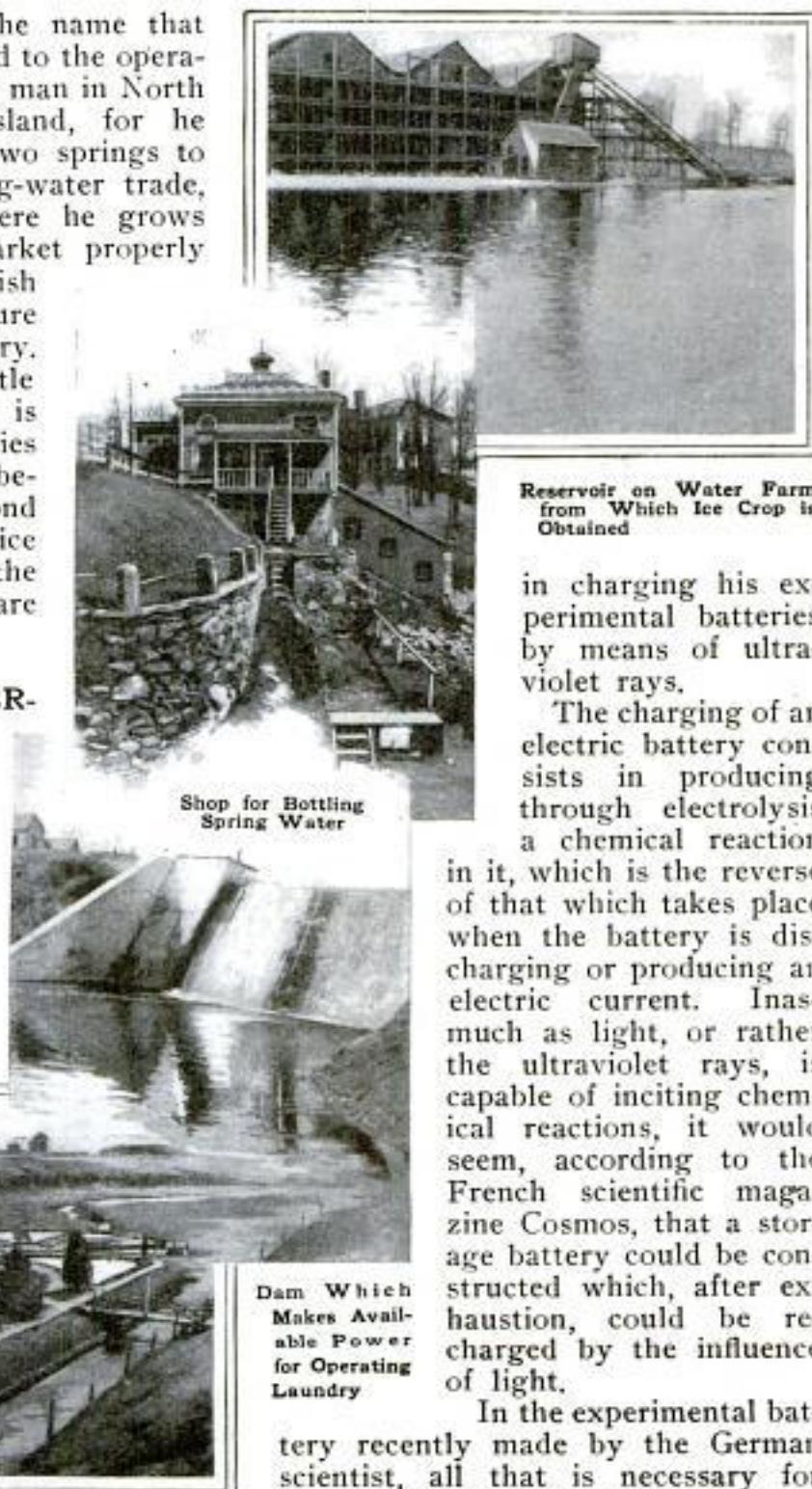


EXHAUSTIVE UTILIZATION OF SPRINGS

Water farming is the name that may properly be applied to the operations of an enterprising man in North Providence, Rhode Island, for he utilizes the water of two springs to supply a bottled-spring-water trade, to keep a swamp where he grows watercress for the market properly saturated, and to furnish a steady flow of pure water to a trout hatchery. Further along the little stream the overflow is dammed and supplies power for a laundry, besides which the mill pond gives a crop of fine ice every winter. All the branches of his farm are showing profits.

CHARGING BATTERIES BY MEANS OF LIGHT

The possibility of some day being able to charge electric storage batteries by exposing them to the sun, or, in other words, to economically transform the



Trout Hatchery on Water Farm, Using Overflow from the Springs

light energy of the sun's radiations into electric energy, is being advanced by a German scientist who has succeeded

Reservoir on Water Farm from Which Ice Crop is Obtained

in charging his experimental batteries by means of ultraviolet rays.

The charging of an electric battery consists in producing through electrolysis a chemical reaction in it, which is the reverse of that which takes place when the battery is discharging or producing an electric current. Inasmuch as light, or rather the ultraviolet rays, is capable of inciting chemical reactions, it would seem, according to the French scientific magazine *Cosmos*, that a storage battery could be constructed which, after exhaustion, could be recharged by the influence of light.

In the experimental battery recently made by the German scientist, all that is necessary for charging is to submit the two chemicals in which its two platinum electrodes are immersed, to the action of ultraviolet rays from a mercury-vapor lamp.

So far the battery is only a labora-

tory curiosity without any pretense to immediate industrial use. The cell has the usual form of a glass jar, and it would require thousands of them to produce a power of one watt, and millions to produce one horsepower.

The German scientist has also experimented with solar light, but this, with the present apparatus, gives four or five times less than the power obtained by means of the ultraviolet rays from the mercury-vapor lamp.

AMMUNITION TRAYS FOR QUEEN'S PATHWAY

History returned to the business of repeating itself in order to make the recent visit of Queen Wilhelmina of Holland to Paris memorable, and the annals of the day written into future histories may place the Dutch Queen in the same category as Queen Elizabeth, giving the place occupied on a certain memorable occasion in the latter's life by Sir Walter Raleigh to the soldiers of a French artillery regiment. The Queen of Holland accompanied the President of France on an inspection of troops in the field and during the inspection a heavy rain fell, turning portions of the field into a morass. In order that the fair royal visitor should not get her feet wet the French artillerymen robbed their guns of am-

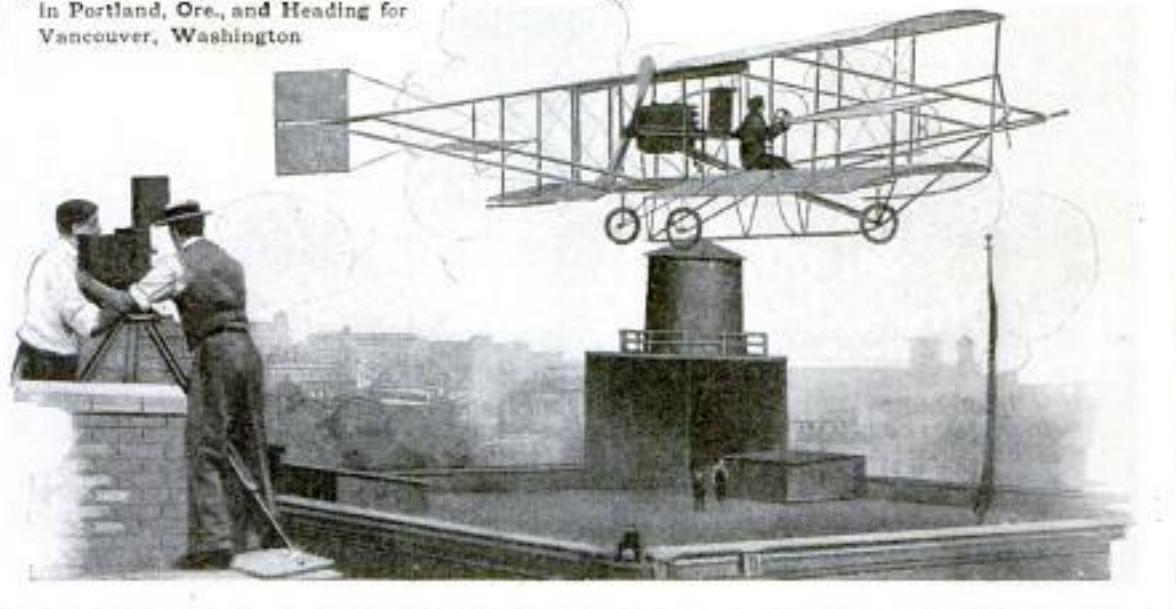
munition trays with which they made a walk for her majesty all the way across the field. As there were only a few trays it was necessary for the soldiers to constantly pick up those that had been passed over and lay them in front of the queen as she progressed in her walk. The wooden pins on the trays to hold cartridge shells in place sank into the soft mud and held the improvised walk firmly in place.

“It's raining kilowatt hours,” is an expression that is being used in Norway during heavy rains, referring to the fact that every inch of rainfall helps to keep filled the reservoirs which feed the great electric-power plants there.



Courtesy Illus. London News
Soldiers of France Save the Shoes of Holland's Queen by Making a Pathway for Her across a Muddy Field

Rising from the Roof of a Building
In Portland, Ore., and Heading for
Vancouver, Washington



AEROPLANE RISES FROM ROOF OF BUILDING

That the provision of roof landing places on some of the latest hotels now erected or about to be erected may some day be of real practical use, instead of being just a good feature for advertising purposes, as at present, is attested to by the accompanying illustration. It shows Silas Christofferson, a young Portland, Ore., airman, rising into the air from the roof of a Portland building. A track was laid on the roof and the machine ran along this until about 25 ft. from the edge, then rose into the air, and started for Vancouver, Washington. Faulty air currents which airmen expect close to buildings did not give him much trouble.

RUSSIAN DANCING GROTESQUES

Apparently even the Russian dancers whose wonderful art has held supreme sway in European capitals, and particularly London, for the past year or two, must present novelties along with more serious work to hold the interest of the general public. At least it would seem so, for in one of the ballets presented at Covent Garden, London's

premier opera house, this summer, the three dancing grotesques shown in the illustration made their appearance.

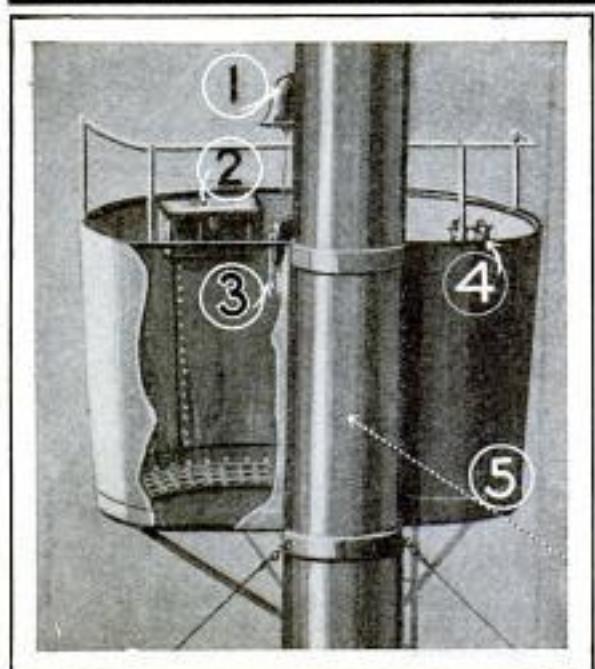
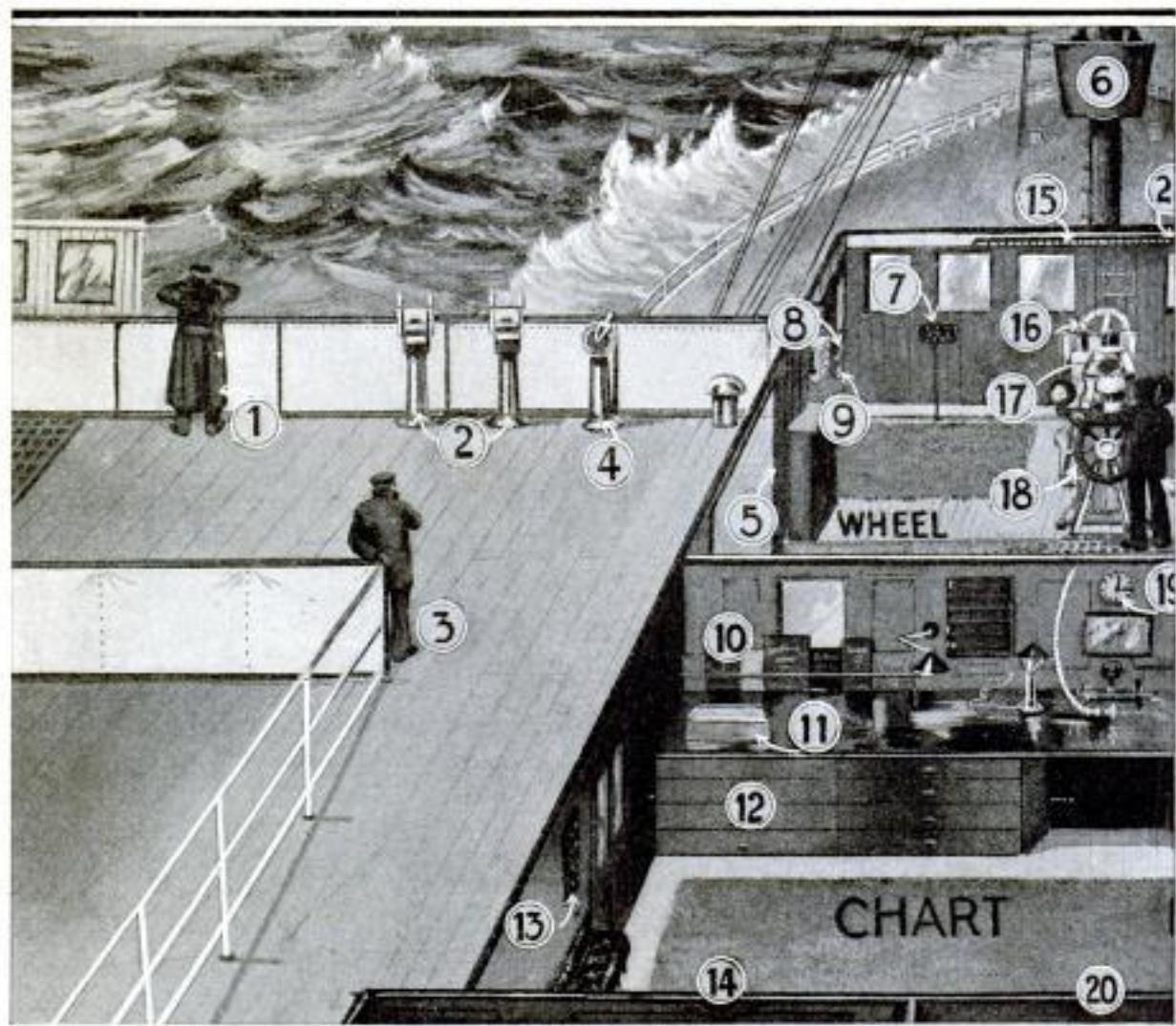
These, however, were only an insignificant part of the ballet, the greater part of which displayed the art of



The Dancing Monsters of a Ballet Presented in England by the Russian Dancers

which Pavlova and Nordkin are still, although not now dancing together, the most famous exponents.

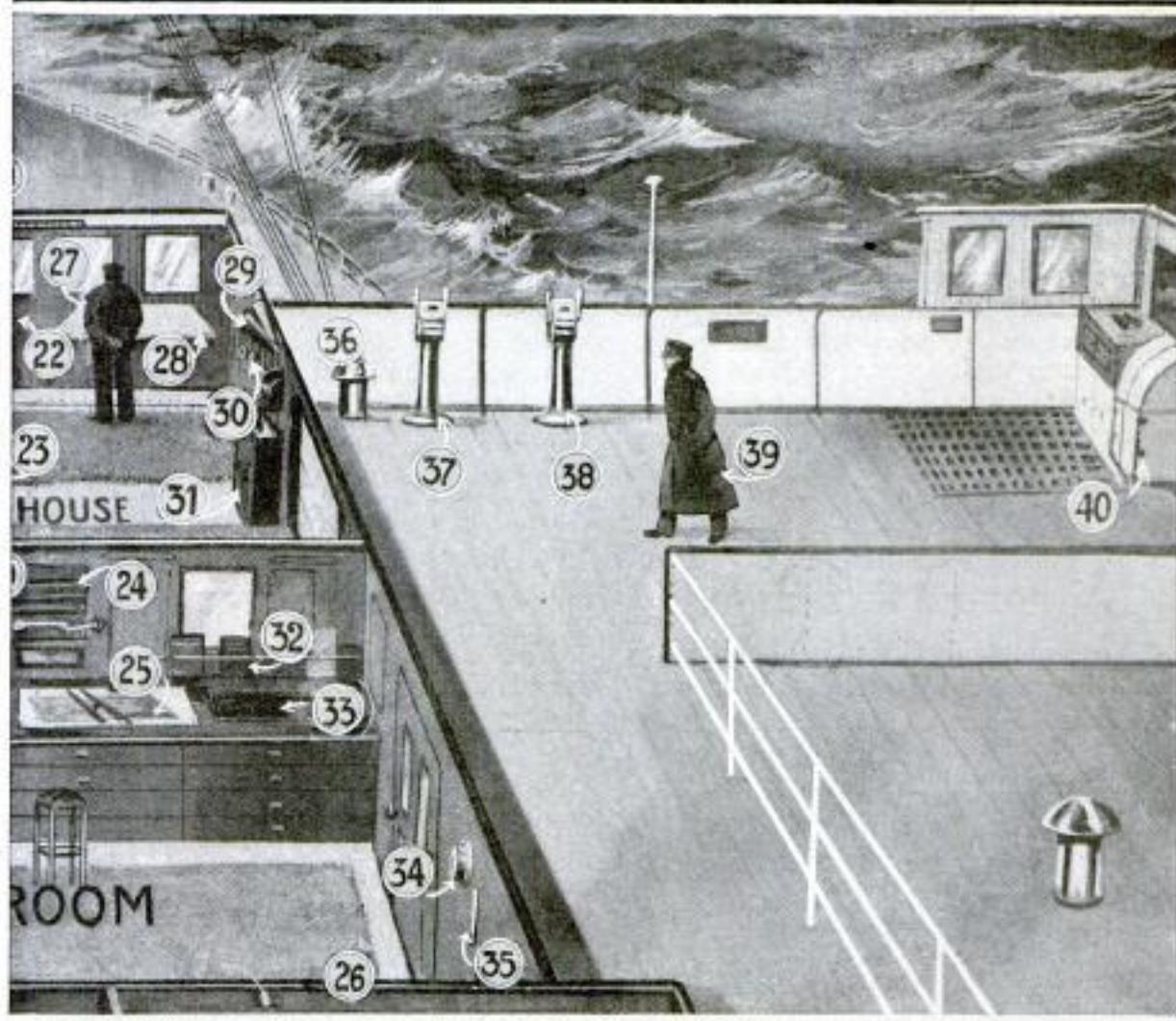
BRIDGE OF MODERN LINER, SHOWING POSITION



The Typical Crow's Nest. 1, Bell, rung every half hour; 2, Box for binoculars; 3, Telephone to bridge; 4, Speaking tubes; 5, Distance to bridge, 125 ft.

The interest evinced by the general public in steamship construction, routine, and navigation since the "Titanic" disaster has naturally been greater and more widespread than ever before. In the accompanying illustration, reproduced by courtesy of the *Sphere*, London, is shown in detail the positions of the officers and men of the watch, and the location of the navigating apparatus on a modern transatlantic liner. It shows, in fact, the arrangement of the bridge of the "Olympic," the sister ship of the "Titanic." 1, Fourth officer (on duty); 2, Port engine and docking telegraphs; 3, Relief quartermaster; 4, Telegraph for watertight doors, etc.; 5, Sliding door; 6, Crow's nest on forward mast, with two men always on duty; 7, Bulkhead telltale, which indicates condition of bulkheads; 8, Submarine signaling receivers; 9, Engine room and crow's nest telephone; 10, Logbooks; 11, Magnetic clock case; 12, Drawers for charts; 13, Bridge switchboard; 14, Chief officer's cabin; 15, Telltale points; 16, Hydraulic ram for governing steering engine; 17, Binnacle; 18, Wheel; 19, Clock; 20, Officers' quarters; 21, Pointer; 22, Fire-alarm bell, ringing throughout the ship; 23, Quartermaster at helm; 24, Shutters pulled down at night; 25, Chart spread on plate glass; 26, Captain's cabin; 27, Ordinary seaman on bridge;

OF NAVIGATORS AND NAVIGATING APPARATUS



28, Work table; 29, Megaphone; 30, Poop telephone; 31, Signal locker; 32, Compass table; 33, Chronometers; 34, Barometer; 35, Thermometer; 36, Ventilator; 37, Starboard docking telegraph; 38, Starboard engine-room telegraph; 39, Chief officer of the watch; 40, Starboard lamp box.

IRON-WELDING PROCESS USED BY ROMANS

Methods employed by Romans, during their occupation of England, in welding iron have come to light through recent investigations by British scientists following the discovery of one of the largest masses of Roman wrought iron ever found in England. This was unearthed at the site of an ancient Roman town west of the village of Corbridge, on the Tyne. The block of iron was 3 ft. 4 in. long by 7 in. square at one end, which was rough and rather spongy, tapering down to about 4½ in. square at the other end,

which was well rounded. It appeared that the block was made by welding together comparatively small lumps of iron produced by a direct reduction process in small charcoal fires. The block was sawed through its entire length and the cut faces planed, polished, photographed and afterward etched with a solution of nitric acid and water and again photographed.

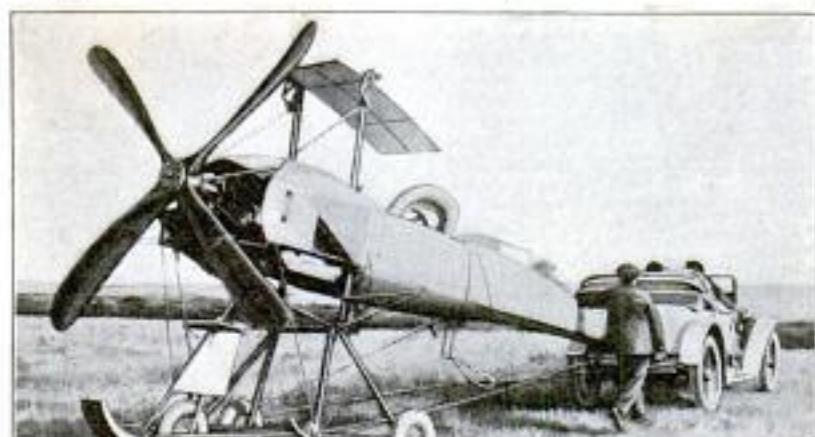
After the faces had been strongly etched, it was easy to trace the lines of welding, not because of the imperfection of the welding, which was gener-

ally very good, but on account of the slight physical difference in character of the metal on the sides of the junctions. From these sections it was perfectly clear how the pieces were joined together. In general terms, slabs approximately lenticular in section were employed. After the smaller end was made, the piece at this stage probably had a similar appearance and shape to the upper end of the block in the condition in which it was found in the furnace with projecting taper pieces. After forming the foundation piece,

two slabs must have been inserted and the mass then heated to welding temperature, after which it was removed and welded by hammering, but by what kind of implements there is no evidence. Step by step this process was repeated until the block of the size and dimensions as described was obtained, plus, of course, the portion which had been removed by subsequent rusting. It seems probable that the block was in course of further development at the time it was left in the furnace.

MILITARY AEROPLANE WITH FOLDING WINGS

The difficulty of hauling aeroplanes along a road and over fields is a prob-



A French Military Aeroplane Whose Wings can be Folded When the Machine is being Hauled over Roads or Fields

lem considered of no small importance in French army circles, and one way developed to do away with much of the difficulty is here shown. The machine is a Moineau biplane, whose planes may be readily folded for road haulage without detracting from the strength and stability of the machine when in flight.

CA school to teach women to be carpenters and bricklayers is to be started at Winfield, Long Island, this fall and it is reported that 40 women have already enrolled as students.

"JAY WALKING" STOPPED IN KANSAS CITY

The city pedestrian who cares not for traffic regulations at street corners, but strays all over the street, crossing in the middle of the block, or attempting to save time by choosing a diagonal route across a street intersection instead of adhering to the regular crossing, is designated as a "jay walker," in Kansas City.

Kansas City recently adopted a new ordinance for the control of foot traffic as well as vehicles, and "jay walking" is to be prevented

as rigidly as "jay driving."

HORSELESS CITY PLANNED IN INDIANA

Horses will be barred from the new town of Speedway, laid out in the environs of Indianapolis. By autumn, it is said, the new city will be well under way and it is expected that the place will become an important industrial center, devoted exclusively to interests allied with the motor-car trade.

It is admitted that the humble equine is aiding in building the new town, but after it is completed, neither

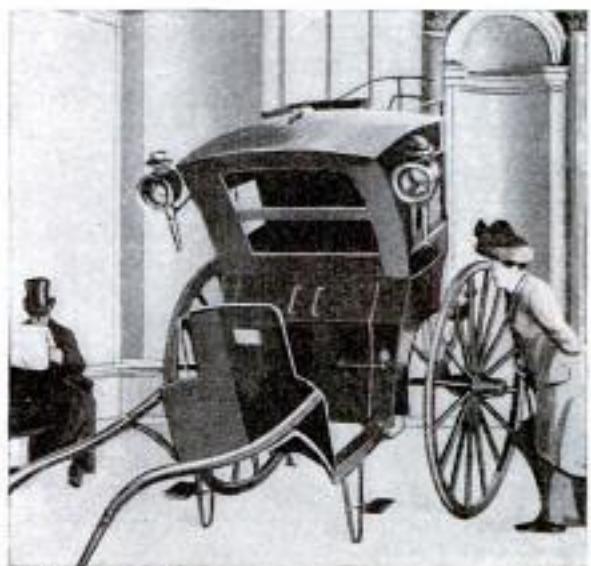
he nor any of his four-footed fellows will be permitted to enter the city sacred to motor-driven vehicles. Leases will stipulate that horses must not be used for any purpose; and the butcher, baker and grocer will necessarily have to resort to the motor truck for delivery purposes. The fire department will be wholly equipped with motor-driven apparatus, and the patrol wagons will race down the streets without clatter of iron-shod hoofs.

The government of Speedway will be intrusted to men identified with the motor trade, and the streets will bear names illustrious in the motor world.

The principal part of the new city will be directly south of the Indianapolis motor speedway, while part of the town will be west of the famous track. No factories will be admitted in Speedway unless they are in some manner identified with the motor-car trade.

Another feature of the horseless town is that it will be constructed throughout of concrete, rendering it fireproof. It is predicted the motor fire department will have little to do.

HANSOM CAB TAKES PLACE IN MUSEUM



The Hansom Cab is so Nearly Extinct in London that One of Them has been Placed as an Exhibit in the London Museum

A SPEAR SHARPENER OF THE ROMANS

Among the recent discoveries at Wallsend, Eng., at the end of the great



Courtesy Illustrated London News.

A Stone Found in England and Probably Used by the Romans for Sharpening Spearheads

Roman wall which stretched across Britain, is a stone which is believed to have been used by the Romans to sharpen their spears. The hollow in the middle probably contained water in which the spearheads were dipped before being sharpened by being rubbed on the sides of the two other cavities.

PLACE IN MUSEUM

That the hansom cab, whose real home was London, should have become so rare in that city that one has actually been installed in the London Museum as a curiosity, may seem startling even to some Londoners at home, to say nothing of the Englishmen who have been away from home even no longer than four or five years and still keep vividly in mind London as they last saw it.

Although "hansom, sir?", is still heard once in a while in London, this type of vehicle is almost extinct, and its complete disappearance is expected in the near future.

The trackless trolley system has been adopted, after thorough tests, for the haulage of freight in Altona, Germany.

THE INFINITELY GREAT AND THE INFINITELY SMALL

By FOREST RAY MOULTON

THE discoveries of modern science have astonished men both by revealing how enormously large the universe is, and also by showing how infinitely small the minutest particles of matter are.

The earth is very big and, until two or three centuries ago, was supposed to be the largest thing in the universe. But the sun is a million times as large as the earth; the whole solar system is 800 million times as big as the sun; the Orion Nebula is 16,000 million times as big as the solar system; and that part of the universe which is now within the range of astronomers' telescopes is 100 million times as big as the Orion Nebula.

While the earth is infinitesimal when compared to the universe beyond, it is yet of enormous dimensions, for there are in it 2,000 million cubic miles of matter. The average weight of a cubic mile of the earth is 23,000 million tons. In each ton there are on the average 10,000 cubic inches. The smallest object visible through a powerful microscope has a diameter of about one ten-thousandth of an inch. There are one trillion of these units in a cubic inch. The material of which the earth is composed is made up of small units of many kinds of matter called molecules. The investigations of Lord Kelvin have shown that it would take 50,000 molecules placed in a row to make a line one ten-thousandth of an inch long. Therefore, in one microscopical unit of material, there are 125,000 billion molecules. The molecules are made up of from two to a hundred smaller masses which the chemists call atoms. Probably an atom is not over one thousandth the size of a molecule. Recent discoveries respecting radium have proved that the atoms themselves are made up of very many smaller particles called electrons, or corpuscles. In an atom there are from 1,000 to 200,000 of these electrons, and on the average the volume of each electron is prob-

ably not greater than one one-hundred-thousandth of that of an atom. From this it is apparent that the infinitely small is as astonishing as the infinitely large.

A little reflection on the very large and the very small leads to some most astonishing conclusions. It is found that things are not great or small in the absolute, but only relatively to ourselves and the things with which we are most familiar. To illustrate this, suppose that on some night every person in the world should become unconscious and that, by some miracle, everything in the world and beyond it should become just one-half as great in length and breadth and thickness as it is now. The question is whether a person would detect any difference when he awoke in the morning. He would find his clothes only half as large in each direction, but they would fit him just the same because he would be only half as large in each direction. His chair would be only half as high, but it would seem just as high to him because he would be only half as tall. When he left the house to go to the car, the distance would be only half as far, but it would seem just as far because his steps would be only half as long. In fact, everything would seem just the same to him, and it can be absolutely proved that there would be no way whatever for anyone to find out that there had been a change. This is, of course, under the hypothesis that only the lengths, breadths, and thicknesses are divided by two, while everything else remains unaltered.

Now, it is clear that there is no reason why it should be supposed that everything is divided by exactly two. The results would be the same if it were supposed that, instead of being divided by two, everything were increased by the factor two, or even to such an extent that a man would be as big as the earth is now. Other men and things would be increased in the

same proportion and he would seem to himself no larger than he does at present. Or, if everything were diminished so that a man became the size of a microbe, he would notice no change and would feel just as big and important as he does now.

It is not in space alone that matters are purely relative. In time the situation is exactly the same. If the earth and celestial bodies moved twice as fast, if clocks ran twice as fast, and if our thoughts came twice as fast, we should not be able to detect any change. If, indeed, everything should run so fast that the experience of a life time would be concentrated into what is now one second, a man would seem to himself to live just as long as he does under present conditions. When misfortunes or troubles overtook him, the hours would seem to drag along as slowly as they do now.

Or, on the other hand, if things should go more slowly, time would seem to pass as fast as it does at present.

It can be gathered from these illustrations that what is great or small, or long or short, is purely so relatively to our experiences. It follows that time, for example, in its most fundamental sense is not measured for a thinking being by clocks and watches or a circling world, but by the number and variety of thoughts that flash in his consciousness. Hence there can be no doubt that a life in its true measure is long or short according to its intellectual experiences.

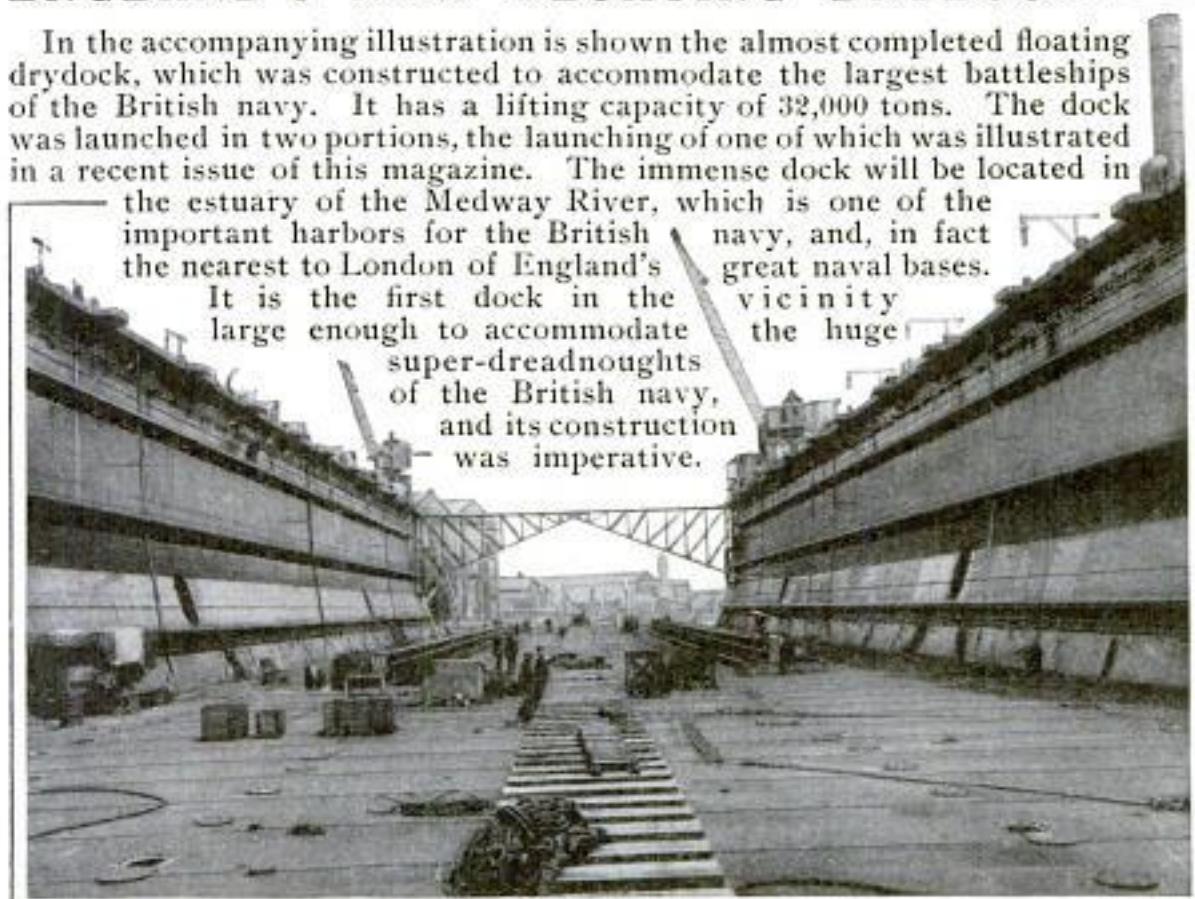
¶The horse butchers of France have recently held a meeting for the purpose of requesting the government to enforce a tariff on imported horse meat in order to protect the native butchers.

ENGLAND'S NEW FLOATING DRYDOCK

In the accompanying illustration is shown the almost completed floating drydock, which was constructed to accommodate the largest battleships of the British navy. It has a lifting capacity of 32,000 tons. The dock was launched in two portions, the launching of one of which was illustrated in a recent issue of this magazine. The immense dock will be located in

the estuary of the Medway River, which is one of the important harbors for the British navy, and, in fact the nearest to London of England's great naval bases.

It is the first dock in the large enough to accommodate super-dreadnoughts of the British navy, and its construction was imperative.



The Floating Drydock Which Will Accommodate England's Largest Battleships

SEAWEED-TRIMMED HAT FOR THE SEASHORE

One of the latest fads at English seaside resorts is the seaweed-trimmed hat, an example of which is shown in



A Novelty in Hat Trimming; Straw Hat Decorated with Seaweed and Shells

the illustration. The straw hat is trimmed entirely with seaweed and shells. The seaweed is dried by a special process, and, when prepared, has all the "life" and luster of fresh seaweed. The sea shells are used to decorate the crown.

GERMAN SURFACE GAUGE

An ingenious surface gauge or level, manufactured in Germany, is shown in this drawing. Adjustably mounted on an upright, the gauge is moved over the surface to be tested so that the pin

just touches it, and by a properly arranged system of levers, the motion, if any, of the pin is magnified a hundred times.



Thus, if there is an unevenness in the surface, the indicator hand will be deflected to one side or the other of the zero point, according to whether there is a depression or a ridge on the surface. The gauge is made in various forms for different purposes.

FIRE EXPOSITION TO BE HELD IN NEW YORK

The first international conference of men interested in the ways and means of fire prevention and extinction, and exhibition showing methods of fire prevention, fire protection and fire fighting, is to be held in New York during the early part of October. Fire chiefs and commissioners from nearly all the principal cities of the United States will be present as delegates; and awards will be made for new inventions.

During the exhibition daily sessions will be held for the consideration of means of fire prevention and protection, addresses being made by builders, architects, engineers, fire chiefs and fire fighters, and insurance men. Fire-proof building construction, fire-alarm systems, automatic sprinklers and fire extinguishers, fire escapes, motor fire apparatus, and, in fact, practically every device for fire prevention and fire fighting will be exhibited and demonstrated.

SIX-WHEELED MOTOR BUSSES

Motor omnibuses with three pairs of wheels will soon be seen on the streets of Paris if the plans of the General Omnibus Company are carried out. Only a small number will be put into use at the outset. The middle pair of wheels will serve as drivers, while the steering will be done by both the front and rear pairs. The objects attained are increased carrying capacity, ability to turn in a small space and the avoidance of skidding. It is pointed out, however, that the spring suspension of the three axles presents a problem which has not heretofore been satisfac-

torily solved. In the new design only the two rear pairs of wheels will have connected spring suspension while the front axle will remain independent. It will depend on the experiences made with the present system of spring arrangement, whether more busses of this type will be put in service or some modification therein devised, before they can be generally adopted.

ANTHRACITE COAL MADE IN LABORATORY

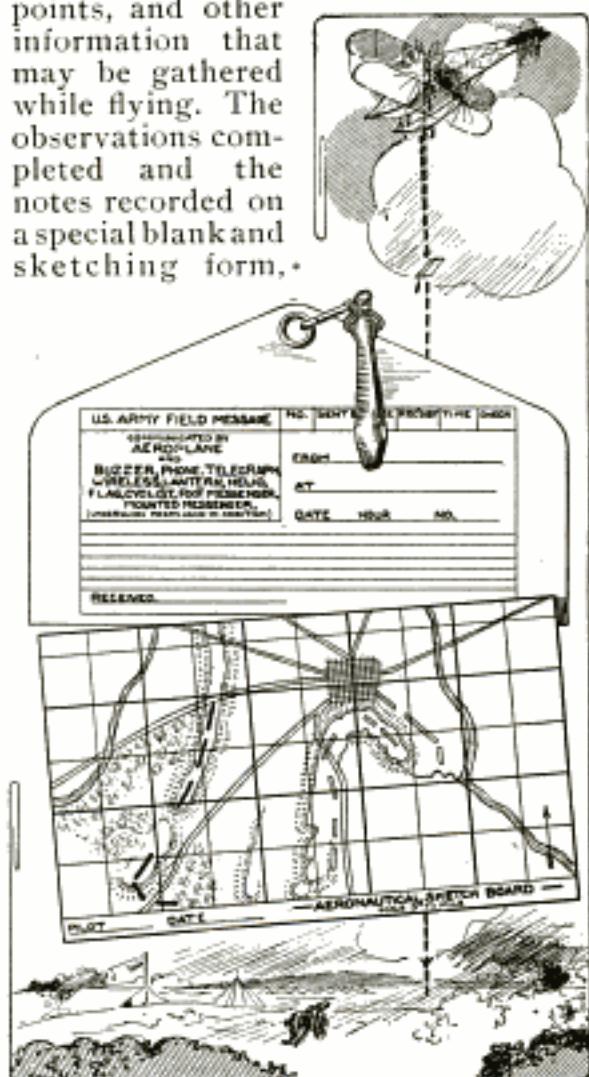
What geologists say nature took millions of years to produce, a German scientist has accomplished in hours in his laboratory. He has made hard coal from peat and even from cellulose, which is the chief part of the solid framework of plants, by heating it in a specially constructed apparatus under great pressure. At a temperature of 590 deg. F., cellulose was converted into coal in 64 hours; and at 644 deg., in eight hours.

From data obtained by a series of such experiments, the scientist has deduced the length of time necessary for the formation of coal beds in nature, and his result tallies closely with that calculated by geologists from entirely different considerations.

SKETCHING BOARD FOR MILITARY AIRMEN

The value of the military aeroplane for scouting purposes has been considerably enhanced by the adoption, in the United States army, of a weighted sketching board by means of which the airman can communicate his information to the forces in the field without descending to the ground. Private Harold Wiedenfeld, of the U. S. Signal Corps Aviation Detachment, is the inventor of the board which is so arranged as to enable a military observer in an aeroplane to mark down all possible information as to the location of the enemy's lines; distance of opposing troops; approximate strength of his

army; conditions of country surrounding position occupied by opposing army; roads leading to advantageous points, and other information that may be gathered while flying. The observations completed and the notes recorded on a special blank and sketching form,



Army Sketching Board Used by Military Observers to be Dropped from Aeroplanes

the board is dropped to the ground, a weight being attached to it that it may fall as close to the desired point as possible.

Experiments with the device have been conducted by Capt. Frederick B. Hennessy and Capt. Charles DeForest Chandler. Both men have gone up, spun around the College Park, Md., aviation field, observed locations of roads, and then dropped the board within 10 ft. of a given spot. In a campaign, it is believed the sketching board would prove of great value to an army in the quick manipulation of troops.

ICE-BREAKING STEAMER OF GREAT POWER

An ice-breaking steamer of unusual design for use in the harbor of Riga, Russia, was completed last spring at Gotenburg, Sweden. Though only 182 ft. long over all, the depth of the boat is 27 ft. 6 in. with a draft of 21 ft. 4 in., so as to put the screws well below the ice line. The beam is 50 ft. 10 in. and the displacement 1,900 tons. From the water line the bow slopes back at a flat angle, so that the keel length is only about 130 ft., and at the junction of the bow and keel is a small

screw (housed under the hull) which serves to disturb the water and ice packs. This is driven by an engine of 1,200 hp., while the main propelling screw is driven by an engine of 2,500 hp. Both engines are triple-expansion and steam is supplied by four boilers. The designed speed is 12½ knots (14.4 miles an hour), but on the trial the vessel developed 14½ knots and 4,000 hp. for the two engines. Flat surfaces are avoided, to reduce the liability of the vessel being caught in the ice, and numerous tanks formed in the hull provide for varying the floating line or "trimming" the vessel, as seafolks say.

In the tests at Riga, ice packs 25 to 30 ft. thick were dispersed by trimming the ship and by the work of the forward propeller, so that the ice breaker could go through the pack with only half its normal power.

LATEST BRITISH MILITARY AUTOMOBILE-WIRELESS

The British army is experimenting with a new automobile wireless outfit for use in the field. The pole for erecting the aerial is made up in sections of such length that they can be placed in brackets along one side of the automobile and thus trans-



The British Army's Automobile-Wireless

ported. The illustrations show the pole sections being taken from the automobile for erection, and the aerial erected and connected up with the receiving and sending apparatus located within the body of the car.

MAKING EXACT DUPLICATES OF ROCK WRITINGS

The United States National Museum utilizes a very ingenious method of preserving the inscriptions and pictures

A Canvas-Covered, Weighted-Bottom, Safety Goal Post for Polo, Invented by an Army Officer



hewn or graved into rocks by the Indians of the southwest. Molds are taken of the pictures by means of wet sheets of paper pressed into the cavities until every part of them is entirely filled. The paper when dried and removed gives a perfect matrix, reproducing even the grain or texture of the stone. Any number of duplicates can thus be made for the use of scientists and institutions, and authentic reproductions of the inscriptions kept, even should the original be effaced from the rock by climatic agencies or by vandals. It is planned to collect as many of these impressions as possible for the museum.

TWO NEW DEVICES FOR POLO

Two new polo features have been introduced by Col. C. G. Treat of the 3rd Field Artillery, stationed at Fort Sam Houston, Texas. One of them is a goal post made of wood, skeleton construction, with a wide tapering base which is heavily weighted with lead, the entire post being covered with canvas, painted white. The weighted bottom makes the post stand

Ball-Holding Device
for the Referee, Made
by Crossing Bicycle
Trousers Clips and
Attaching Them to
a Leather Collar

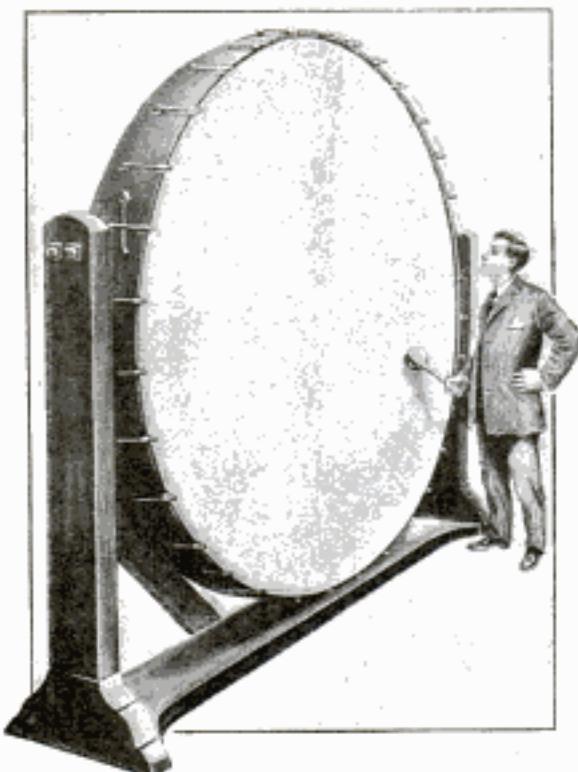
firmly, but allows it to yield when struck by horse or player without doing serious injury to either, as sometimes occurs with the stationary posts. It has been tried in practice and found to work well.

The second device is a ball holder for the referee, and is an excellent example of how a device designed for a certain use can be adapted for other uses. The ball holder is made of heavy leather in the form of a flat collar, attached as shown in one of the illustrations. Each side of the holder is equipped with three ball containers, made by crossing a set of trousers clips of the kind used by bicycle rid-

ers. These are attached to the leather collar by small leather strips and rivets. The hardest riding cannot dislodge the balls from these clips, yet they are easily removed when needed.

BIG DRUM FOR MUSICAL FESTIVAL

In the accompanying illustration is shown a big drum, about 10 ft. in diameter, built especially for the Han-



The Great Drum Built Especially for the Handel Musical Festival in England

del musical festival, recently held in London. The great festival chorus included considerably more than 3,000 voices, and the total number of performers was 4,000.

COMPRESSION OF LUNG AS TUBERCULOSIS CURE

Treatment of tuberculosis by nitrogen-gas compression of the lung recently has been revived after falling into disuse since it was first introduced by a Chicago surgeon 15 years ago. Successful results have been reported by physicians in Europe and America. The method employed is compression

of the lung so that no air gets into it, and it is thus given complete rest, with a minimum of blood on which the germs can grow. Frequently the patient's condition improves. Authorities state that it can be used only in one-sided cases with not many adhesions between the lung and chest wall. The apparatus consists of a water-locked tank similar to a gas receiver, a tank of compressed nitrogen and the necessary tubes and needles for injecting it into the cavity between the lungs and the wall of the chest. One physician recently reported that the tubercular process was arrested in an astonishing percentage of cases in which it was employed by him.

THE BATTLE-CRUISER RIVALRY IN EUROPE

The rivalry between England and Germany in the construction of battle-cruisers, the wonderful new type of fighting ship developed by England and imitated by Germany, is, if anything, more tense than was the rivalry in dreadnaughts.

A battle-cruiser is a ship possessing the battleship's armament of heavy guns, but comparatively lightly armored, defensive strength being sacrificed for aggressive qualities. With their great speed, extended steaming radius, and powerful guns they can roam the seas unmolested except by other ships of their own class. Even the dreaded torpedo-boat destroyers are no menace, the sustained speed of the battle-cruiser at sea being higher than that of any present-day ocean-going destroyer.

When Germany produced in the "Moltke" the fastest battle-cruiser in the world, with a speed of 29.5 knots (33½ miles an hour), England pinned her hopes on the new "Lion," and she was not disappointed. This remarkable vessel succeeded, under very trying conditions and with coal only as fuel, in making the phenomenal speed of 31.5 knots (35.75 miles an hour). Under favorable conditions, and using oil, it is believed that the "Lion" can

make about 33 knots (38 miles). The next German battle-cruiser, which was laid down last year, but as yet is not far enough advanced to be known otherwise than as "K," much is expected. Just how much is not clear, for secrecy is rigidly maintained in the German navy, but it is believed that she will be driven by engines of at least 90,000 hp., as compared with the 80,000 hp. of the "Moltke," and that she will carry 14-in. guns. This vessel is expected to be more powerful and faster than the British "Lion," the "Princess Royal," and the "Queen Mary," the latter being a little larger and more powerful than the "Lion."

England, however, will probably have completed her "Tiger" by the time the German "K" is ready, and thus Germany will remain behind in the race, as this ship will, it is believed, develop 100,000 hp. It is also believed that she will be longer than 725 ft., that she will be a 32,000-ton ship, and that her speed will be greater than 33 knots.

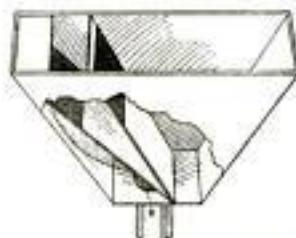
ARTIFICIAL RUBBER FROM SEA FISH

According to the British Consul at Amsterdam, a factory is being built at the fishing harbor of Ymuiden for the manufacture of artificial rubber from sea fish. The process was invented by an Amsterdam physician, and he claims that the product has the same qualities as real rubber and is not affected by benzine or heat.

Estimates show that the fish rubber can be produced at a cost representing only about one-sixth of that required for the manufacture of real rubber, due in part to the manufacture of a valuable by-product in the shape of a concentrated tonic food containing phosphor albumen.

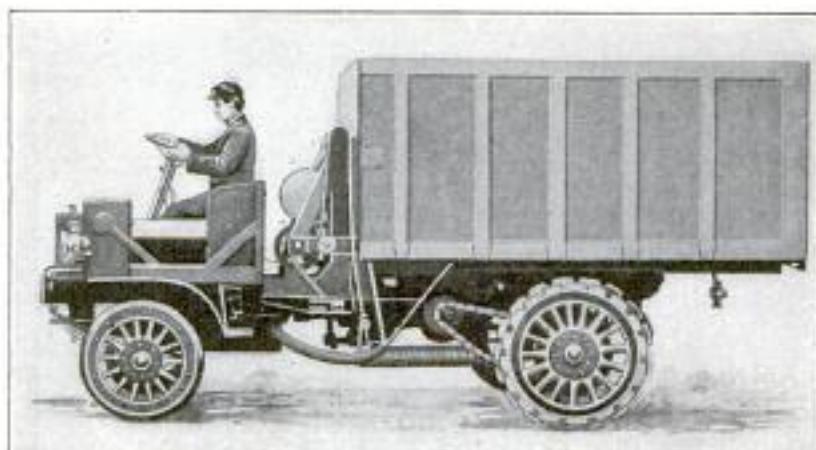
NEW IDEA IN GASOLINE FUNNELS

A funnel which requires no chamois-skin strainer to eliminate water and sediment from gasoline as it is poured into the tank of a car, is another novelty for motorists. The gasoline is poured into the large top opening and must flow from the surface through two special copper screenings before reaching the outlet in the bottom of the funnel. The claim is that, the screen being so fine, not a particle of water can flow through it, although gasoline passes readily.



SEVEN-TON DUMPING MOTOR TRUCK

A motor coal truck of seven tons' capacity, which can be dumped by one man, is being turned out by an eastern automobile concern. The ease and expedition with which a single man can dump a full load by operation of the hand mechanism, is due to the fact that the load-carrying body is balanced near its middle. All that is necessary is to turn a crank



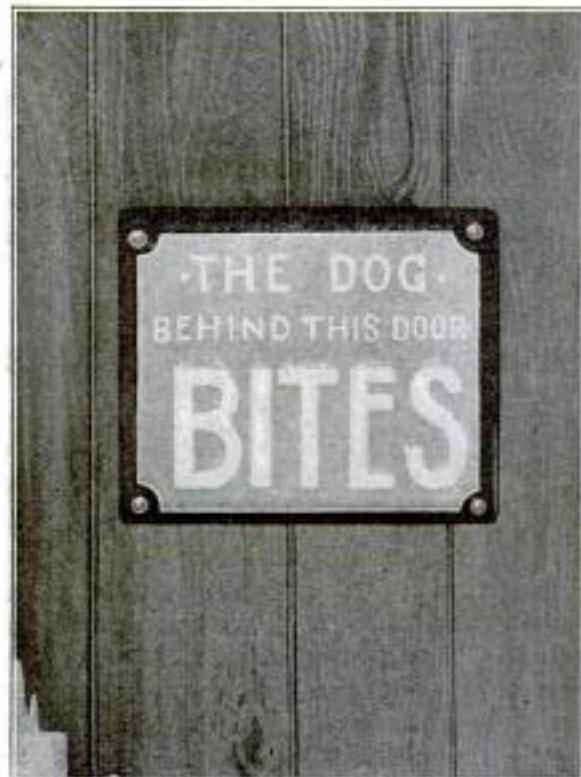
A 7-Ton Coal Truck Having a Hand-Dumping Body

until the center of gravity of the almost balanced weight falls back of the pivot,

the tipping then being automatically completed by the load itself. The whole load is, of course, carried over the rear wheels, which are heavily reinforced.

NEW "BEWARE-THE-DOG" SIGN FOR DOORS

Many kitchen doors or doors of entrances for the use of tradesmen in England are now found bearing a



"The Dog Behind This Door Bites" is a New Substitute for the Stereotyped "Beware the Dog"

novel warning sign against dogs, with a more ingenious legend than the old "Beware the Dog," which has become so stereotyped as to command but little attention and usually fails to serve its purpose.

DISEASES OF ANCIENT EGYPTIANS

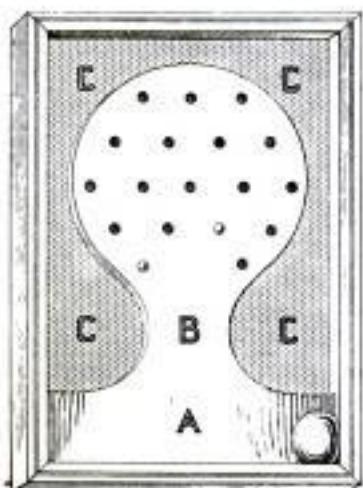
Studies of mummies and skeletons from the tombs and excavations of Egypt, which have been carried on at a medical school in Cairo by Drs. Elliott Smith and Marc Armand Ruffer, have disclosed many points of identity

of the diseases of from two to four thousand years ago and the diseases of the present day, as well as marked differences. Gallstones and similar concretions were common, and evidences of bacterial infections were found in some bodies. Malignant diseases, gout, leprosy, infantile paralysis, and appendicitis seem to have existed in the days of the Pharaohs, while hardening of the arteries due to age was common then as now.

In the study of skeleton remains, which are the most satisfactory of all for historical study, there is confirmation of the previously demonstrated fact that an inflammatory condition of the joints resulting in deformity was remarkably prevalent in the Nile Valley, both during the earliest times and later; the spinal column, the finger and toe bones being very often so affected. So far no evidence of tuberculosis of the bones has been found in old Egyptian remains. Dental disease was prevalent, the molars, as now, suffering most. The old tradition that the ancient Egyptians were skilled in dentistry is not substantiated, however, by recent investigations.

A MERCURY GAME POPULAR IN FRANCE

A mercury game requiring steady nerves and much patience has recently become popular in Paris. It is played with a rectangular glass-covered box having a portion of the bottom raised slightly above the remainder. The upper, circular part of the raised portion is provided with a number of holes or cups. A ball of mercury is placed



in the box on the part marked A, and the purpose of the player is to roll the mercury over the portion marked B, and then successively over the holes in such manner as to fill them with mercury without the ball splitting up in several parts or any part of it rolling down into the lower portion of the bottom.

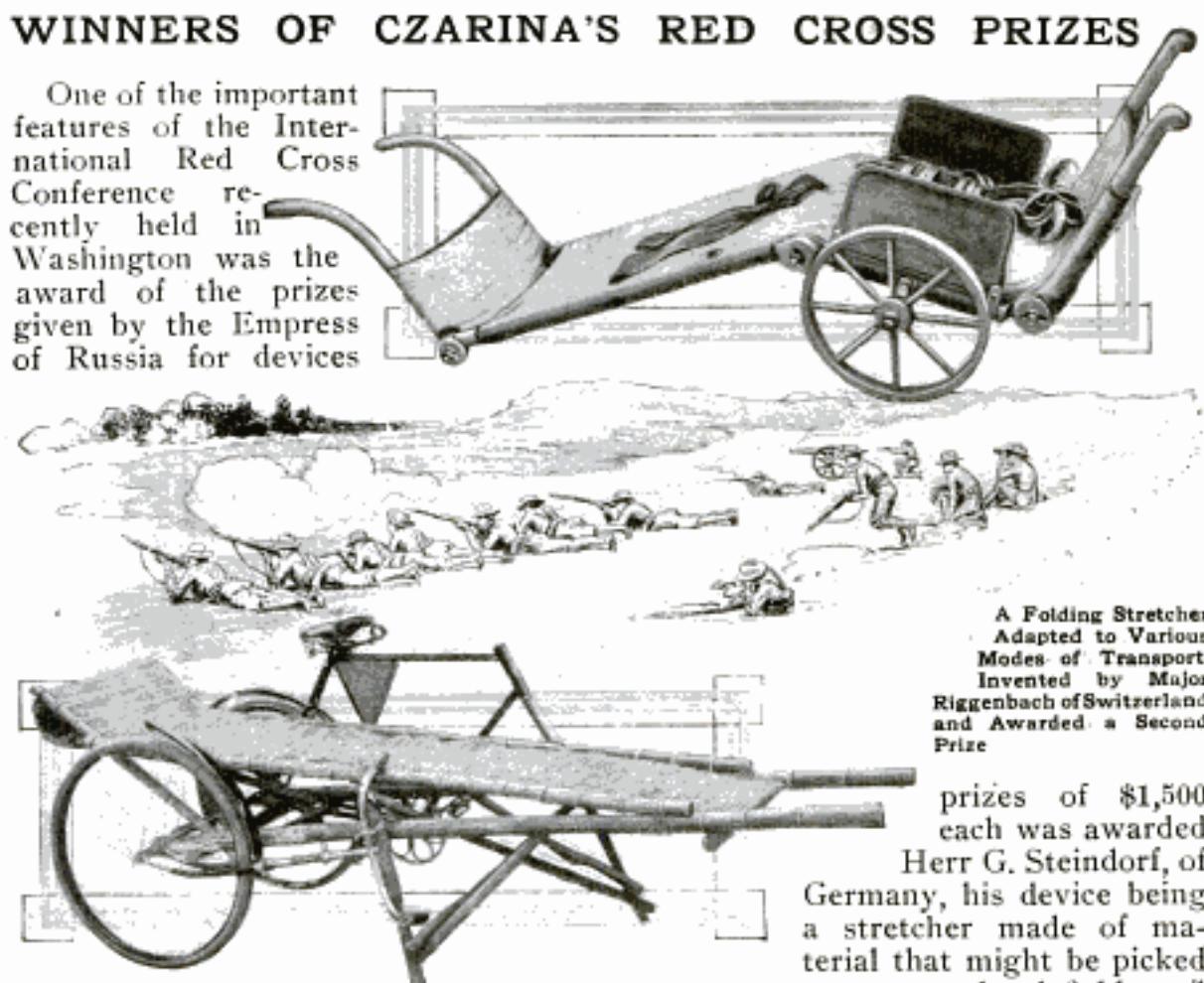
The difficulty increases, of course, the closer the holes are to the edge,

and higher values are therefore given to these holes than to those nearer the center, the central hole having the lowest value.

To anyone who has observed the seemingly uncontrollable nature of mercury, it would appear almost impossible to play the game successfully, but it is asserted that with some practice all the mercury can be disposed of in the holes in three or four minutes.

WINNERS OF CZARINA'S RED CROSS PRIZES

One of the important features of the International Red Cross Conference recently held in Washington was the award of the prizes given by the Empress of Russia for devices

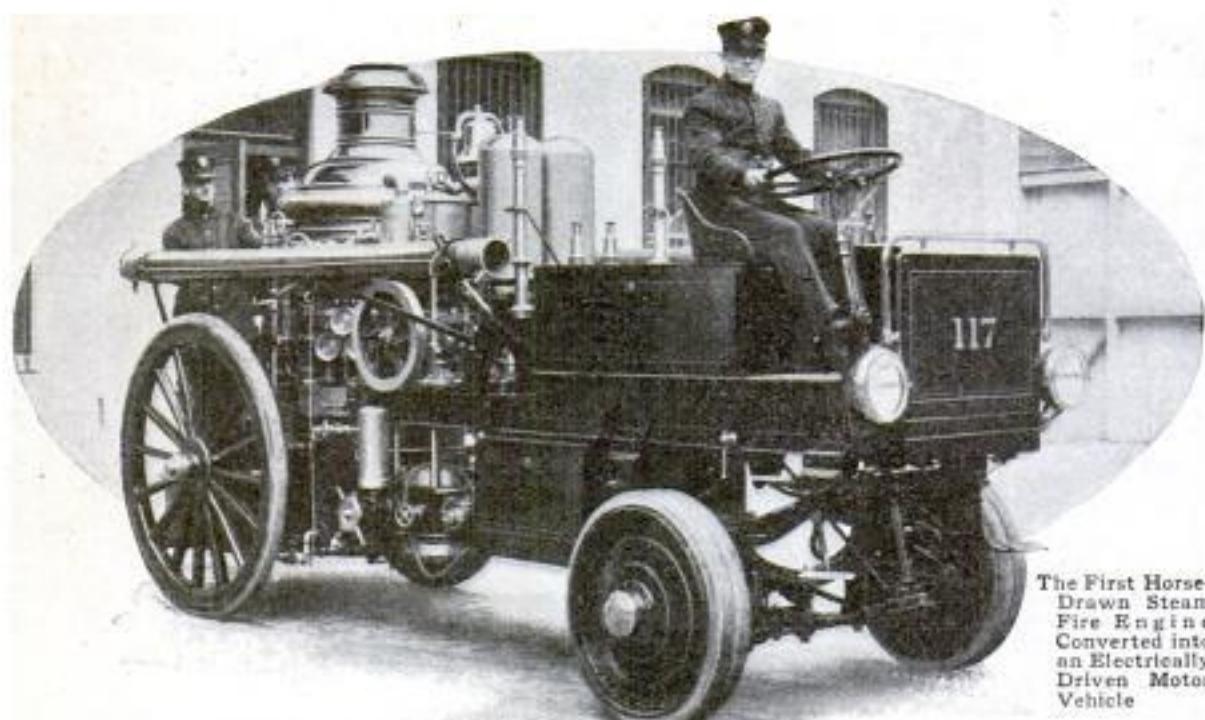


Stretcher Using Bicycle Wheels, and Made of Material Taken from the Field—Invented by Herr Steindorf of Germany, Awarded Second Prize

for the care of wounded on the field of battle. There were nine prizes in all, each consisting of a sum of money, the award being made by a committee of the International Red Cross. Dr. Louis Lesage, of the Necker Hospital, Paris, was given the first prize of \$3,000 for an X-ray laboratory automobile designed by him. One of the two second

A Folding Stretcher Adapted to Various Modes of Transport, Invented by Major Riggensbach of Switzerland and Awarded a Second Prize

prizes of \$1,500 each was awarded Herr G. Steindorf, of Germany, his device being a stretcher made of material that might be picked up on a battlefield and mounted on the wheels of a bicycle. The other second prize was given Major Riggensbach, of Switzerland, for his invention of a folding wheeled stretcher that can be used for a variety of modes of transportation. Two American army surgeons, Maj. Paul S. Halloran and Capt. Henry L. Brown, were among the six persons awarded third prizes.



The First Horse-Drawn Steam Fire Engine Converted into an Electrically Driven Motor Vehicle

NEW YORK'S FIRST ELECTRIC FIRE ENGINE

Many old horse-drawn steam fire engines have been converted into motor-driven vehicles by equipping them with gasoline power plants, and their number is steadily growing, but the first fire engine to be converted into a motor vehicle by the installation of electric motors is now in operation in New York. Its runs average about one

per day, and it has a speed of 20 miles an hour over smooth, hard roads, and takes grades with ease.

The weight of the engine before conversion was 9,800 lb., as compared with its present 15,000 lb. An 80-cell 11-plate battery is used, which will run the machine 20 miles on a single charge.

NEW FRENCH MONOPLANE PILOTED BY BOY

A new French aeroplane, known as the Jourdan monoplane, and piloted by Jean Jourdan, a boy only 16 years



A Hooded French Monoplane Piloted by a 16-Year-Old-Boy

old, is shown in the accompanying illustration. It has a wing span of about 45 ft., a length of 32 ft., and is

driven by a 70-hp. Gnome motor. The interesting feature of the design is the hooded central section.

REVOLVING ELECTRIC FLOOR SCRUBBER

An electric floor-scrubbing machine, the brush of which is cylindrical in shape and revolves instead of being rotary in its action, has been successfully used in the Roosevelt hospital, New York. It was invented by an attendant of this hospital.

The machine supplies water to the floor which it scrubs and then takes up the dirty water. The water-supply tank holds about 5 gal. Under the tank is a $\frac{1}{4}$ -hp. motor which drives the brush at a speed of 400 revolutions

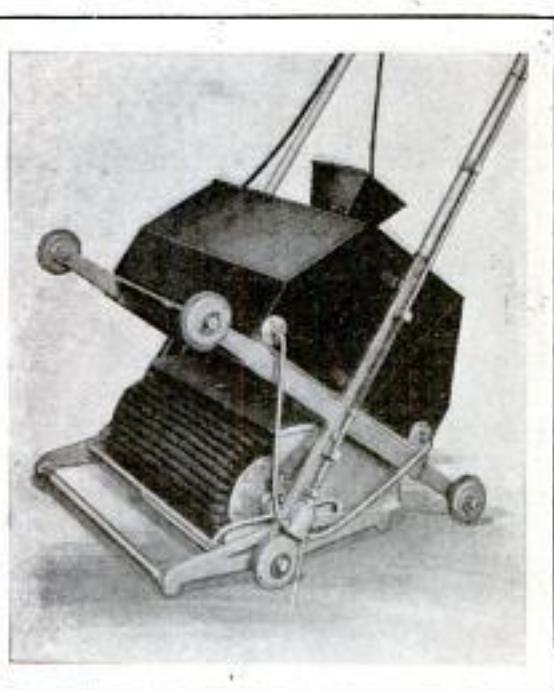
per minute. The brush is 7 in. in diameter, so its bristles travel about 700 ft. per minute, sweeping the water up into detachable receptacles. By a simple system of gears the brush can be adjusted to press lightly or heavily against the floor.

The machine works as well in either direction, thus obviating the necessity of turning it around. When the end or side of the room is reached all that is necessary is to swing the handle over. This reverses the action of motor and brush, and shuts off the clean water on one side and starts the flow on the other. The reversing of the brush also tends to keep the bristles straight.

Watermelon seeds are considered a delicacy in China and are served at meals much as salted almonds are served in the United States.

NEW "RAINBOW" ELECTRIC LAMPS

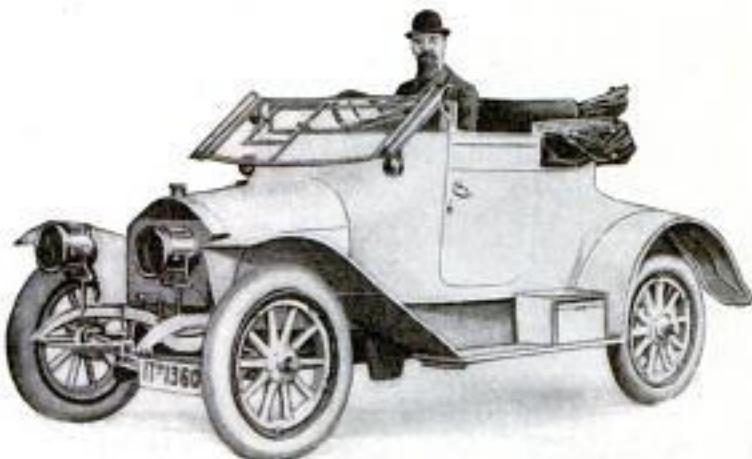
A multi-color or "rainbow" electric lamp is being marketed by an English concern. In general appearance it resembles an arc lamp, but it is fitted with an opal globe inside of which are three metallic-filament lamps of 25 cp., having red, blue and yellow globes respectively. Inside the case and immediately above the lampholders are three thermo-flashers, with adjustable platinum contact points, set to connect the lamps in and out of circuit, and in such a way that either one, two or three are alight at a time. With the different lamps going out or coming on, different combinations of colors are produced, which are evenly diffused by the opal globe. Inasmuch as the flashers are not synchronized, the colors are constantly changed. Of course, when only one lamp is alight, only the particular color of its bulb is shown.



A Revolving Electrically Driven Brush for Scrubbing Floors

GERMAN TWO-PASSENGER AUTOMOBILE BODY

A new two-passenger automobile recently delivered to Prince Gwoff, Germany, has an interesting type of body



A Two-Passenger Convertible-Body Automobile, Owned by Prince Gwoff, of Germany

designed by a Stuttgart firm. This body can be so easily converted that it is a simple matter to operate the car either as a closed or open one, the mechanism effecting the conversion being of simple character. Either a baggage carrier or a rumble seat may be used at the back of the car.

"FACTORS OF SAFETY" IN LIVING CREATURES

By JOHN B. HUBER, A.M., M.D.

After the last Harvard-Yale boat race it was the losing crew which gave the greatest evidence of exhaustion. In one instance the Yale men were so utterly "all in" that they had to be lifted out of their boat. One might have expected just the reverse,—that the Harvard men, having taken the extra exertion necessary to win, had worked more nearly to the limit of their powers and should have been more played out than the Yale men in consequence.

But to think that way is not to take into account the stimulus of victory on the one hand, and the depressing effect of defeat on the other. It has been estimated that the mortality from wounds in a defeated army is in proportion to that of the victors as four to three or even as three to two. The science of psychology gives the explanation. Success brings into play the factors of safety in the living body; failure has the reverse effect to weaken these factors.

What, then, are those factors of safety? They are our reserve forces, which avail us in times of inordinate stress and strain; and they keep our bodies in fairly normal condition in spite of many injurious external agencies. The term was borrowed from the mechanical engineer by Dr. J. S. Meltzer, when he addressed the Harvey Society in New York City on the "Factors of Safety in the Animal Structure and the Animal Economy." The mechanical engineer deals with factors of safety in estimating the margin of safety required in constructing engines, bridges, houses, and so forth. In mechanics it is calculated that structures should be capable of withstanding not only the stresses of reasonably expected maximum loads, but also those of six or seven times such loads. The factor of safety is founded upon human ignorance of what might happen; and upon a wise desire to provide against such contingencies.

So, in the human machine, the potential energy of many organs, as the heart, for instance, far exceeds the needs of normal everyday humdrum existence. In the case of many of our functions the necessary mechanisms are doubled and even trebled. And the function of one organ is often assisted by other organs. Living tissues, such as make up our bodies, are abundantly provided with one factor of safety which is peculiar only to living things, and to no other kind of machinery—that is, the mechanism of self-repair. These factors of safety promote the integrity of life, the perpetuation of the species, and have an important bearing on the process of natural selection.

Nature is never stingy; indeed there never was a more extravagant dame; her gifts are far beyond the requirements of sentient creatures. The roe of a single fish, for example, often contains millions of potential fish lives; and if the law of the survival of the fittest became inactive for a single season no vessel could make its way through the fish that would choke up the ocean.

Medical history furnishes countless instances of physical endurance, apparently superhuman, that can be explained only by reference to factors of safety. For example: Who is not thrilled in reading how Napoleon led his army across the Alps, to the point where his troops believed themselves absolutely spent; not another step could they carry their panting bodies! But here that magnificent, though untutored psychologist, had his band play "La Marseillaise." Its strains amid those snow-capped heights were a mighty stimulus to courage and patriotism, whereby such reserve strength was awakened as the rank and file had not dreamed themselves possessed of; so that with triumphant shouts they finished the titanic task their determined general had laid upon them.

AN "S O S" BELL FOR WIRE-LESS STATIONS

While testifying at the "Titanic" inquiry in London Marconi told of an invention he is now perfecting that will cause an alarm bell to ring at all wireless stations receiving a danger signal sent out by a ship in distress.

By the ringing of this bell, an ordinary seaman stationed near the wireless apparatus of the ship while the operator is off duty would know that some ship was sending out a distress message and notify the operator. In order to make the idea effective Mr. Marconi says it would be necessary to alter the wireless regulations formulated by the international convention, so that the "S O S" danger signal could be accompanied by a long dash or sequence of waves, lasting for a period of 15, 20 or 30 seconds. This would cause the bell to give a prolonged ring, enabling anyone on duty nearby to know that a ship required assistance.

RUBBER OBTAINED FROM "TIRUCALLI" TREE

A new source of rubber has been found in the "tirucalli" tree of Natal, according to a French magazine. This tree has hitherto been regarded as commercially useless, and it was but lately discovered that it yields a juice which contains rubber.

A company was organized to work a concession in the Tugela Valley, and has been exporting about a ton a week of the crude material to London where it has been found useful for electrical insulation and for mixing with Para rubber. There are an unlimited number of "tirucalli" trees in Natal, and their recuperative qualities are so great that they can be tapped once a month.

ELECTRIC DRIERS FOR HOSIERY

An electric method of drying and finishing hosiery has been developed by an electric company in the east for



A Battery of Electrically Heated Forms for the Drying and Shaping of Stockings

the use of stocking-manufacturing concerns and for laundries. The stockings are drawn over electrically heated forms which both dry and shape them.

AN AVIATION SIGNPOST IN ENGLAND

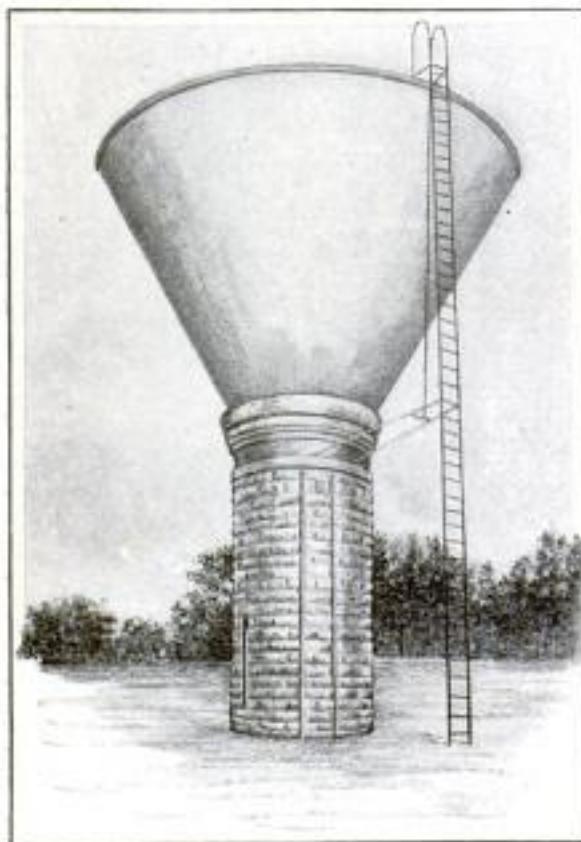
On the top of a motor-repair shop and garage at Bromley South, on the main road between Hastings and London, Eng., has been erected a unique



aviation signpost. The summit of the post carries a small model aeroplane of the biplane type, while the direction arms carry a monoplane and a racing automobile.

FUNNEL-SHAPED CONCRETE WATER TANK

In Victoria, Australia, is a water tank the shape of which is probably unique among such constructions.



An Unusual Water Tank Constructed of Brick and Concrete

The funnel-shaped tank, which has a capacity of 3,150 gal., is constructed of reinforced concrete, while the lower section is of brick masonry.

A SOUTH AFRICAN SHAFT-SINKING RECORD

A new record for shaft-sinking in the Rand mines has recently been made, according to the South African Mining Review. It states that the southeast shaft of the Government Gold Mining Areas Consolidated was sunk 233 ft. during March, exceeding

the previous record of 213 ft., made at the Brakpan mines in July, 1907. Another record performance was the sinking of 583 ft. during the first quarter of the year at the State mines. The shaft measured 45 by 10 ft. and from it 8,155 tons of muck were removed during the month, equivalent to 35 tons per foot. The sinking was done between the 1,738-ft. and the 1,971-ft. levels through 155 ft. of rock and 78 ft. of shale. Natives did all the hand drilling and shoveling; 82 natives and a white assistant comprising the sinking crew for one shift.

PNEUMATIC HAMMER FOR DRIVING NAILS

A pneumatic nail-driving hammer, particularly designed for use by carpenters in nailing laths, has been patented by an inventor of Zion City, Ill. The apparatus may also be used in connection with various classes of pneumatic tools, such as rock drills.

Attached to the tube containing the piston or hammer is a nail box or hopper, having a capacity of about 250 nails. The vibrating of this hopper causes the nails to be tripped up and forced, one at a time, into a rubber tube, through which they are forced to the head of the hammer by the compressed air. Protruding slightly over the head of the hammer is a trip rod which, when forced against the wall or object to be nailed, allows the nail to be set in the hammer head, and also releases the trigger which allows the compressed air to pass into the power chamber. The piston rod, striking the hammer, then drives the nail home.

The weight of the hammer is about $3\frac{1}{2}$ lb., and a speed of 100 nails a minute can be attained.

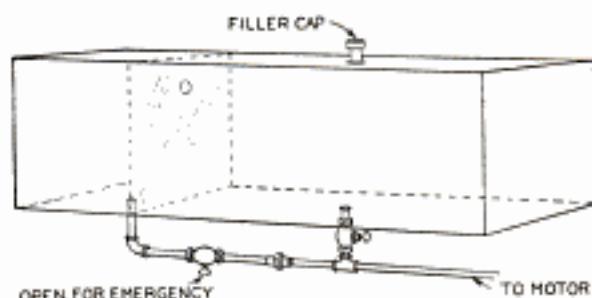




Auxiliary Gasoline Tank for an Automobile

The regular supply tank on the automobile is fitted with a partition at such a distance from one end that the space thus provided will hold approximately 1 gal. of oil. About 2 in. from the top make a hole 1 in. in diameter and connect the compartments with pipes and fittings as shown.

Gasoline overflows into the auxiliary tank when the main tank is filled. This provides a reserve supply of 1 gal. of oil, which will run a car at least 10 miles. As the tank is automatically filled, it requires no attention except when the supply in the main tank runs



The Small Auxiliary Tank is Automatically Filled and Kept Ready for an Emergency

out, then, if one happens to find himself where no oil can be obtained, the emergency valve is opened and the reserve supply used.—Contributed by James McCaffrey, Pawtucket, R. I.

Aid in Mowing Fodder

It is often necessary to put shock fodder in a mow, and by loading the shocks whole, looping a rope around each and attaching the apparatus shown in the illustration in place of the regular hayfork, the fodder can be handled as easily as hay.

The device is shown set to receive the loop end of the rope in Fig. 1, and

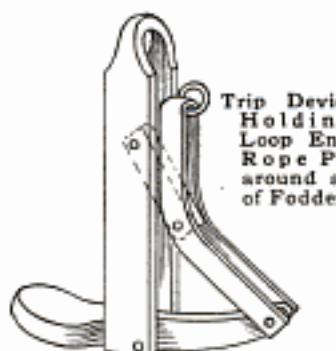


FIG. 1

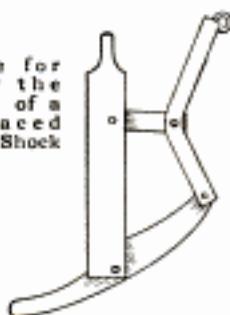
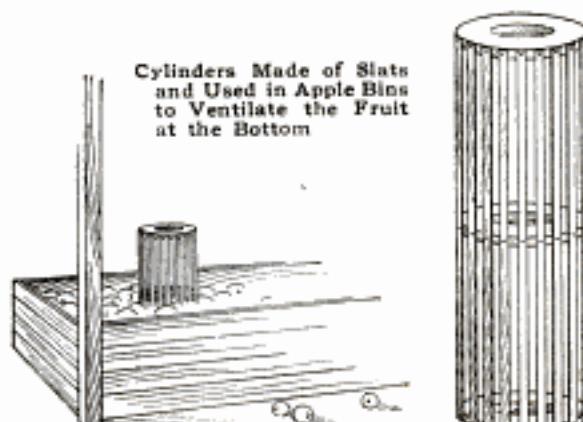


FIG. 2

tripped, in Fig. 2.—Contributed by Stanley M. Hadley, Danville, Ind.

Ventilating Apple Bin

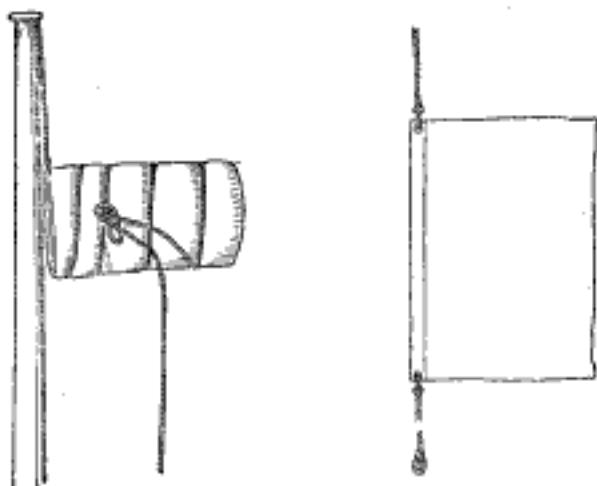
Apples placed in large bins will not keep well, unless they are well ventilated. Effective ventilation can be accomplished by making cylinders of slats and placing two of them in a bin 8 ft. square. The disks for the cylinders are 12 in. in diameter with holes in the center, as shown in the



sketch. The manner of using the cylinders is obvious.—Contributed by R. L. Keenan, Sabula, Iowa.

Raising a Flag

The proper method of storing and raising flags, ensigns, etc., is illustrated in the sketch. The manner of rolling



The Rope as It is Tied about a Folded Flag for Raising It to the Top of a Pole

a flag for storing is shown in the first sketch, while the second shows the usual equipment for a flag. The flag is attached to the signal halyard with a snap hook in the upper grommet. The grommets are fastened to the canvas heel of the flag.

The flag is made up as shown in the first sketch and when hoisted to the truck, a pull on the down haul releases it and allows the flag to break out. A number of flags may be made up in this manner and be broken out simultaneously, or they may be hoisted and broken out one at a time by doing each one up separately. A sharp pull on the down haul will then release the lower one, another pull, the next one, etc. The flags should be stored away all rolled up as in the first sketch.—Contributed by Geo. M. Petersen, Buffalo, N. Y.

Cleaning Gun Barrels

Lead and powder residue as well as rust can be easily removed from rifle and gun barrels, and if the barrel is not badly pitted, it can be restored to its original brightness and cleanliness by using ordinary steel wool in cleaning. Take a wad of the steel wool just

as large as can be conveniently drawn through the barrel and attach it to a stout cord or a small wire and draw it back and forth in the barrel. All rust and residue will be thoroughly removed from the barrel in a few minutes.

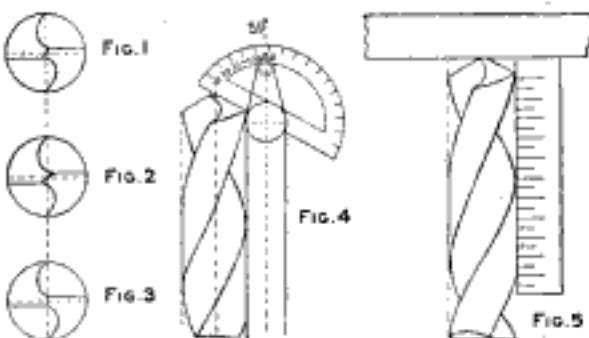
The steel wool will not scratch or injure the barrel in the least. The No. 0 steel wool is the most desirable to use, and it can be obtained at almost any hardware store.—Contributed by H. A. Jonset, Faulkton, S. Dak.

Grinding Twist Drills

Few operations on tools in the shop are more frequently disappointing than the grinding or sharpening of drills. That the cutting edges have a correct and uniform angle with the longitudinal axis of the drill, that they be exactly equal in length, and that the lips of the cutting edges be sufficiently backed off or cleared, are points generally understood as essential, though not always attained.

If the clearance of a drill is insufficient or imperfect, it will not cut. When force is applied, it resists the power of the machine and is crushed or split. After grinding a drill by hand, it is well to start it and observe the character of the chips.

The grinding lines of a drill are placed slightly above the center to allow for the proper angle of the point, which is an important factor. This



A Drill must Have the Cutting Edge with the Proper Angle and Clearance to Produce a Perfect Hole

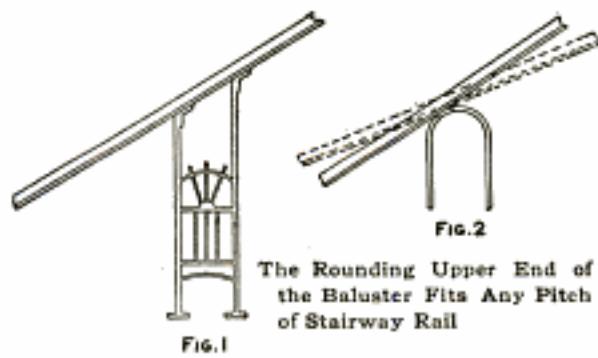
angle is an index of the clearance. If the angle is too great, the drill will not cut right; if too small, it may not cut at all. The proper angle is shown

in Fig. 1. Too sharp an angle is shown in Fig. 2, and an angle that lacks clearance is shown in Fig. 3. Drills properly ground have their cutting edges straight when ground to the proper angle, which is 59 deg., as shown in Fig. 4. Grinding to a less angle leaves the lip hooking, which is likely to produce a crooked or irregular hole.

An effective method of determining the clearance is to set the point of the drill on a plane surface and hold the scale as shown in Fig. 5. The clearance is easily shown by revolving the drill. This will also show whether the height of the cutting lips and the length of the cutting edges are equal. In grinding a drill, preserve its original form which will usually insure rapid and satisfactory work.—Contributed by W. H. Addis, Lafayette, Ind.

Baluster Design to Fit Any Pitch of Stairway

In making cast-iron balusters for stairways, the general construction of which is shown in Fig. 1, I found that scarcely any two flights of stairs had the same pitch, and the workmen constantly had to change the pattern to suit the pitch of stairs. As this work caused considerable expense, I designed a baluster that could be made up and carried in stock ready to fit any pitch of stairway. The general design was not changed, but the upper end, to which the rail is attached, was



The Rounding Upper End of the Baluster Fits Any Pitch of Stairway Rail

FIG. 1

made semicircular in outline, so that it would fit any pitch of rail, as shown in Fig. 2.—Contributed by Jas. F. Napier, Montreal, Can.

Repairing a Worn Friction Disk on an Automobile

The aluminum disk A on my friction-drive automobile became worn around the edge, which prevented the necessary pressure at the rim of the disk.

To overcome this difficulty I undertook to build the plate up true. The metal could not be dressed off true because this would make it too thin, and furthermore it would be too expensive as the machine would have to be taken apart.

The repair was easily accomplished in the following manner: I secured a piece of saw steel, C,—an old circular saw would answer well—about $\frac{1}{8}$ in. thick, and drilled $\frac{1}{8}$ -in. holes through the steel, $\frac{3}{4}$ in. from the edge, countersinking the holes to receive $\frac{1}{16}$ -in. tire bolts.

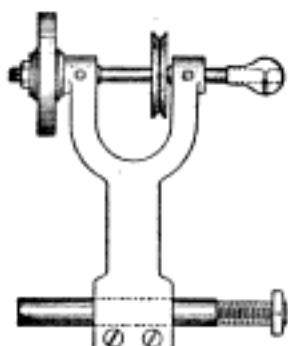
The space between the disk A and the plate C was filled with a paper friction ring at B, thick enough to let the steel plate just touch the center. The parts were clamped together and the holes continued through the paper ring and the aluminum disk. Tire bolts were put through the holes and drawn up evenly all around and the heads filed off even with the surface of the plate. The bolts should be cut off short and burred to prevent the nuts from backing off. The repair cost about \$3, while a new disk would have cost \$15. The steel gives better satisfaction than the aluminum.—Contributed by Chas. A. Pettit, Rossville, Maryland.

Cleaning Brass

Small brass castings can be cleaned by heating them slightly and then dipping them in a solution of sal ammoniac. The pieces will come out as bright and clean as if new. This cleaning process is the same as that used in cleaning a soldering iron.

Truing Collector Rings

The machine shown in the sketch was fitted up by a correspondent of the Engineer for truing up badly worn collector rings on a compensated revolving field alternator. He describes its operation as follows:



The emery wheel is passed across the rings while the machine is running slowly. The wheel is run at a speed of 3,000 revolu-

tions per minute by a small motor. It puts the rings in fine shape and saves taking the head to a machine shop. Then, too, while turning the rings, they are liable to get out of place. Strips are bolted in the place of the brush holder and the rig clamped to the bolt by two screws, the bottom of the casting being split to insure a tight grip, will serve the purpose.

An easy way to trap vermin is to place an ordinary steel trap in the center of a tile, placed in such a position as to serve as an entrance to their prey.

How to Build a Motorcycle Garage

The owner of a motorcycle does not always have a suitable place to keep his machine. The hall or back porch affords no place and the basement air is usually too damp, and rusts the metal parts as well as being injurious to the tires. The need of a small garage, in which there is ample room to do small repairs, is realized by most riders, but few know that the material for a small house can be bought for less than \$25.

The average rider is usually mechanically inclined, at least sufficiently so to be able to build a small garage, if

suitable plans are at hand. While the following material list and accompanying plans are for a house 6 by 8 ft., the builder can alter them if a larger garage is desired, but it must then be taken into consideration that the cost increases more rapidly than the length of the boards and timbers.

The sill foundations are built up of brick or stone, preferably red brick, on the place selected for the garage. The foundations are located at each corner and under each stud. Care should be taken to have the tops of the foundations level and high enough

LIST OF MATERIAL FOR A 6 BY 8-FT. GARAGE

SILLS

2 pieces, 2 by 4 in., 8 ft. long.

JOISTS

6 pieces, 2 by 4 in., 6 ft. long.

STUDS

10 pieces, 2 by 4 in., 6 ft. long.

NOGGING PIECES

2 pieces, 2 by 4 in., 8 ft. long.

2 pieces, 2 by 4 in., 6 ft. long.

PLATES

2 pieces, 2 by 4 in., 8 ft. long.

2 pieces, 2 by 4 in., 6 ft. long.

RAFTERS

12 pieces, 2 by 4 in., 6 ft. long.

BENCH MATERIAL

1 piece, 2 by 4 in., 10 ft. long.

2 pieces, 2 by 4 in., 6 ft. long.

5 pieces, 2 by 6 in., 6 ft. long, S-4-S.

SIDING AND ROOF

Sufficient tongue-and-grooved boards, S-4-S, to cover 300 sq. ft.

FLOOR

Sufficient tongue-and-grooved boards to cover 50 sq. ft.

ROOFING

Sufficient prepared roofing material to cover 120 sq. ft.

FINISHING MATERIAL

4 fascia boards, S-4-S, 1 by 4 in., 6 ft. long.

2 door facings, 1 by 4 in., 6 ft. long.

1 door header, 1 by 4 in., 3 ft. long.

2 pieces for window facings, 1 by 4 in., 6 ft. long.

7 corner boards, 1 by 4 in., 7 ft. long.

WINDOW

1 single casement.

DOOR

1 paneled door, 2 1/2 by 6 ft.

HARDWARE

1 pair of door hinges.

1 pair of window hinges.

1 window bolt.

1 door lock.

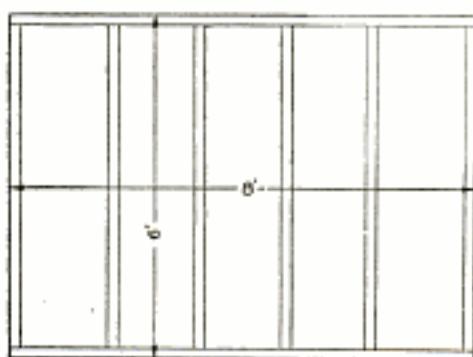
4 lb. of 20-penny nails.

8 lb. of 8-penny nails.

to prevent rotting of the lumber from the moisture of the ground.

Cut the sills and joists to length, taking into consideration that allowance must be made on the joists for the thickness of the sills, to make the over-all measurement 6 ft. in width. In some instances the joists and sills can be notched, but a more substantial way is to cut them as shown in the floor plan and drive large spikes through the sills into the ends of the joists.

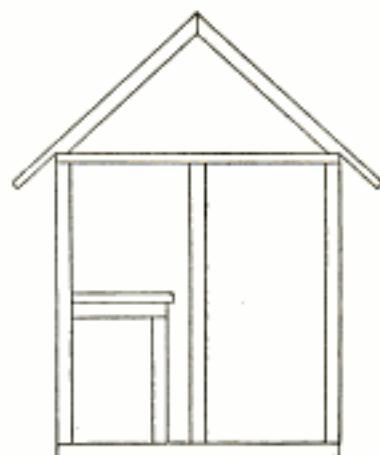
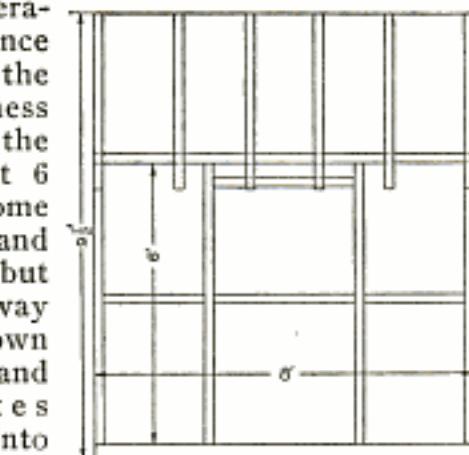
The 10 studs are cut to length and the pieces for the plates mitered on the ends. The location of the studs are marked on the sills and end joists, the two intermediate studs being set so that their inner surfaces, which receive the window sash, are each 30 in. from the end, or outside. After marking the locations for the studs on the joists



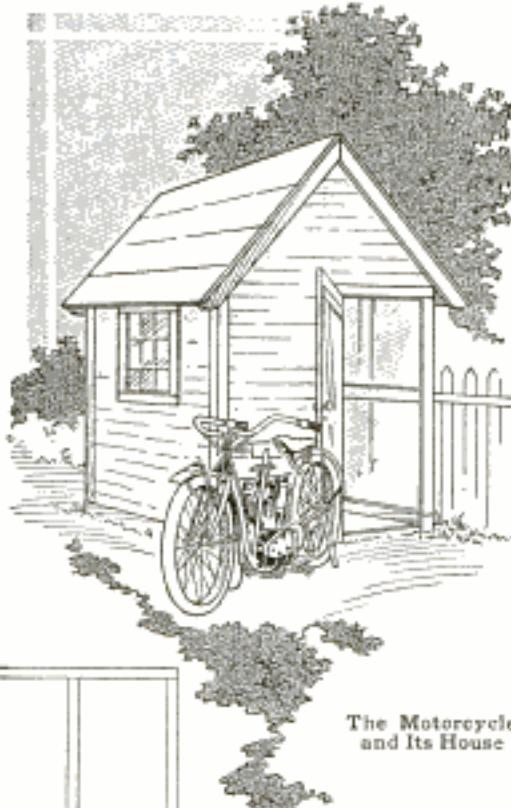
Floor Plan in Which the Two Sills are Shown Spiked to the Ends of the Joists

and sills, the plates are marked to match them and then spiked to the upper ends of the studs. The two sides are raised first, and the studs toe-

nailed to the sills, then plumbed and braced temporarily. The ends are raised in the same manner, the stud in



Side and End Elevation, Showing the Location of the Bench



The Motorcycle and Its House

each being set in the center. The mitered corners of the plates are spiked in a manner similar to that in which a picture frame is nailed together. The nogging pieces are cut to fit in between the studs and fastened on them halfway between the top and bottom.

The roof is a half-pitch and the rafters are cut on a miter at the upper ends, the lower ones being notched out to form a projection for the eave. The two end pairs of rafters are fastened on the plates and plumbed with their outside surfaces at right angles to the outside of the end studs. The other four pairs are spaced evenly between them.

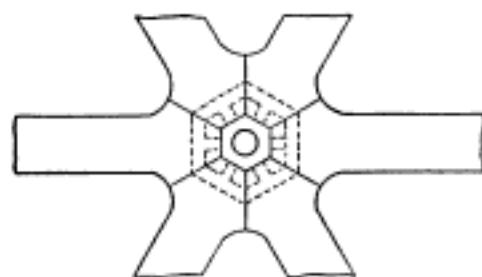
In nailing on the roof boards, the work should be begun at the bottom, and 1 ft. of the boards should be allowed to project over the end rafters. The boards are then covered with the prepared roofing.

The siding boards are nailed on in a vertical position, allowing openings for the door and window. The door is so hung on the center end stud that it swings outward.

The bench is built up level with the nogging pieces on the side having the window. The crosspieces, holding the top planks of the bench, are spiked to the studs just under the nogging pieces, and the inside ends are supported on posts. The planks are spiked to the crosspieces.

To Hold Spokes of Wheels in Wood Patterns

The spokes in a pattern for a wood wheel are very difficult to fasten at the hub so as to make them hold like



The Metal Forms a Hexagon Which Holds the Ends of All the Spokes

one piece. I use the method shown in the sketch, which not only draws them tightly together, but holds them firmly. This method is very simple. A hole is bored through the end of each spoke and another hole bored to intersect it at right angles, as shown by the dotted lines. After the spokes are in position melted babbitt metal is run into the holes. As the metal cools it shrinks, thus drawing the joints closely together.—Contributed by Chas. R. Poole, Los Angeles, Cal.

Water from a Drainpipe Leak Absorbed with Brick

An emergency call to repair a leak in the drainpipe under the bathroom floor of a fine residence, came to our shop just as we were leaving on Saturday evening. Upon examination it was found that a permanent repair could not be made without putting in

a new piece of lead pipe and wiping at least two joints.

We decided to try to leave the job if possible until the next workday. The leak was closed as much as possible by hammering the metal, but we could not close the aperture to keep it from leaking. The drops were noted and it was estimated that a pint would leak out in about 12 hours. As there was a space only about $4\frac{1}{2}$ in. between the pipe and plaster and an opening in the floor, 4 by 12 in. in size, it was out of the question to get a pan large enough under the leak to hold the water.

When looking around in the basement we found a pan, 1 in. deep and 9 by 12 in. in size, also some dry soft brick. We placed the pan on the plaster and the brick in the pan. For two days the brick absorbed the water as fast as it dropped from the leak. This method can be used by plumbers in many places.—Contributed by C. H. Bierly, Zanesville, O.

Cutting Piston and Valve-Stem Packing

The sketch illustrates a simple device for cutting round or square ring piston or valve-stem packing. It is always a more or less difficult matter to cut the ring exactly correct in length, to say nothing of getting each end the proper angle so that they will match when closed around the rod. This wood gauge or mandrel obviates all difficulties, giving size of packing, size of rod and angle of cut. The sawed slot, Fig. 1, for cutting may be at any angle desired. The cut is made as shown in Fig. 2. This little device will save the engineer much valuable



FIG. 1



FIG. 2

The Wood Mandrel with Knife Slot and Packing Groove and Manner of Cutting Packing

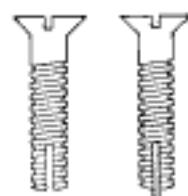
time, as usually several rings of packing are cut and thrown away before the proper size has been obtained.

How to Clean Portable Farm Engines

This method of cleaning farm engines is from the Thresherman's Review: Dissolve 1 lb. concentrated lye in about 2 gal. water, and with a mop saturate the engine with the liquid, being careful that it does not get into the oil holes of the journals and bearings. After the lye has eaten all the grease and gum from the surfaces, clean thoroughly by scraping and brushing, and after the iron is dry and free from grease, apply a thin coat of lead paint. When this is perfectly set, paint the iron a deep black and varnish heavily. Coloring, striping or decorating should be done before varnishing. Then the engine can be easily and quickly cleaned with a dusting cloth, and escaped oil can be wiped off.

To Make Worn Threads of a Bolt Hold

Where it is necessary to use a screw or bolt having worn threads, slot the threaded end and drive a flat wedge into the opening as shown in the sketch. This will make the bolt or screw hold almost as well as if new threads had been cut on it.—Contributed by Edward Matthews, New York City.

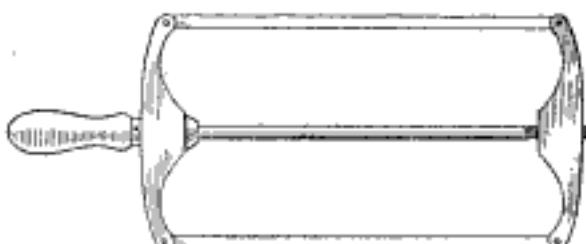


Double-Blade Hacksaw Frame

The purpose of the double-blade hacksaw frame shown in the illustration, is to dispense with extra frames for holding saw blades of different grades of fineness. This frame will hold a coarse and a fine-tooth blade at the same time.

The crosspieces carrying the blades are made of brass, 5 in. long, and the center rod is of steel, $\frac{3}{8}$ in. in diameter and 12 in. long. A flange is brazed on the rod just in front of the crosspiece at the handle. The other end of the rod has a long thread to fit in a threaded hole of the end crosspiece.

This is for drawing the blades tight by turning the handle. The blades



Two Blades are Placed in the Frame and Tightened Equally by the Handle on the Rod

are held in slots with pins, in the usual manner.—Contributed by P. H. Tierney, Lynn, Mass.

How to Measure a Resistance with a Voltmeter

A voltmeter, whose resistance is known, and some source of electrical pressure are all that is required to measure a resistance by this method. The voltmeter is first connected across the terminals of the source of pressure and the value of the total pressure in volts determined. It is then connected in series with the resistance to be measured, and the combination connected to the source of pressure. The connections of the voltmeter for measuring the total pressure are shown in Fig. 1 by the dotted lines, and the full lines indicate the connections when the unknown resistance is in circuit. The first reading of the voltmeter,

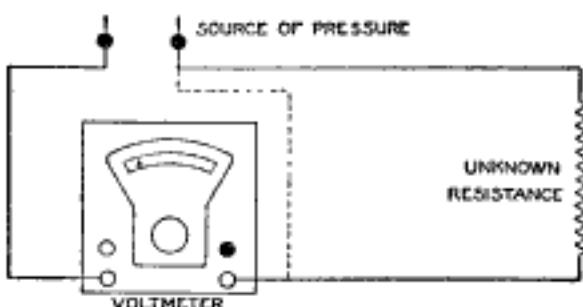


Fig. 1
The Ordinary Wiring Diagram and the Connections of a Voltmeter for Measuring the Total Pressure

which is the total pressure, we shall call E_t , and the second reading, or the one obtained when the voltmeter is in series with the unknown resistance, we will call E_u . Assuming the total pressure to remain constant, the

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pressure over the unknown resistance, which we will call E_x , can be determined by subtracting the value of E_v from the total pressure, E_t , or

$$E_x = E_t - E_v$$

In any series circuit in which there is a direct current, the drop in pressure over the various parts bear the same

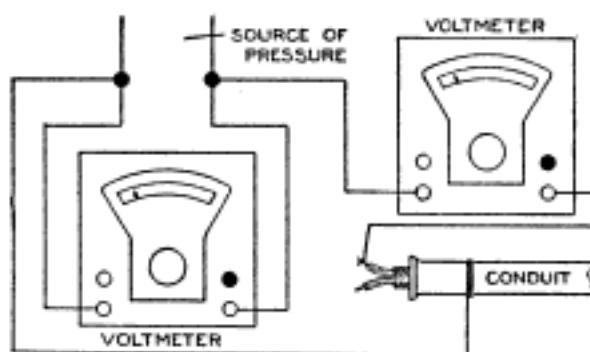


FIG. 2

Connections for Measuring the Insulation Resistance between a Circuit and the Conduit in Which the Circuit is Placed

relation to each other as exists between the resistances of these parts. Since the resistance of the voltmeter, R_v , the drop in pressure over the voltmeter E_v , and that over the unknown resistance, E_x , are all known, we can determine the value of the unknown resistance, R_x , by substituting in the following equation:

$$\frac{E_v}{E_x} = \frac{R_v}{R_x}$$

Solving this equation for R_x gives

$$R_x = \frac{E_x \times R_v}{E_v}, \text{ and}$$

since $E_x = E_t - E_v$, we have

$$R_x = \frac{[E_t - E_v] R_v}{E_v}$$

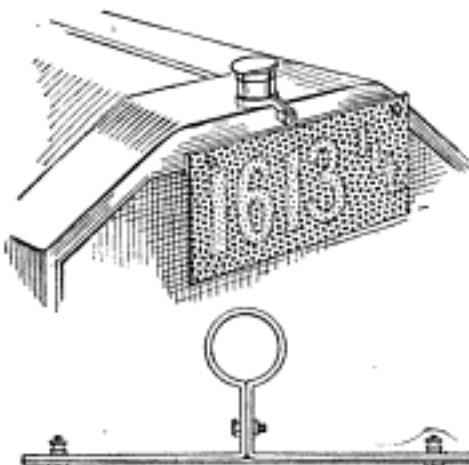
This method of measuring resistance is usually employed in determining the value of high resistances where a very great degree of accuracy is not required, such as the insulation resistance of a lighting or power circuit, insulation resistance between the field or armature windings of a machine and the metal parts of the machine, etc. The connections for measuring the insulation resistance between a circuit and the conduit in which the

circuit is placed, are shown in Fig. 2. Each wire can be measured separately, and the side having the greatest leakage should be connected to the terminal of the generator that is permanently grounded, if one side is grounded. By making the connection as indicated above, the leakage on the line will be less than if the connections be reversed.

The nearer the resistance of the voltmeter to the value of the unknown resistance, the more accurate is the result. If the value of the total pressure is continually changing, two voltmeters should be employed, one being permanently connected across the source of pressure, and the other in series with the unknown resistance. The resistance of the voltmeter across the line need not be known.

License-Number Holder for an Automobile

The new perforated license numbers are intended to be placed in front of the radiator on an automobile. A much neater method than the old way of fastening it close to the radiator with wire, is to make a bracket from a piece of band iron, which is easily bent



The Perforated License Tag is Held Firmly and Clear of the Radiator by the Bracket

to the shape desired. It should be made in accordance with the pattern in the sketch, but the dimensions will, of course, be governed by the size of the tag and of the radiator water cap. Three holes are drilled after the

strip has been cut and bent to shape, one through the double strip between the loop and straight part, and one at each end, as shown. Small bolts are used in these holes for attaching the tag to the bracket, and to hold the bracket on the filler cap.—Contributed by E. K. Marshall, Oak Park, Ill.

Ink Fountain for Covering Large Surfaces on Tracings

Draftsmen sometimes find it necessary to cover considerable spaces, such as wall sections, shadows, etc., with ink. To do this with a pen is very tedious work and also injures the tracing cloth. A brush is not always obtainable, but a scrap of paper can be had anywhere. Roll the paper up into a sharply tapering cone, as shown in

The Paper Point will Hold and Spread the Ink on Tracing Cloth Better than a Pen



the illustration, and tie it when a good point is obtained. This will make an implement for spreading ink which is far better than a brush. Dip the point into the ink and apply it to the parts to be covered.—Contributed by R. F. Pohle, E. Lynn, Mass.

Sizing Mandrels

It often happens that a mandrel may be necessary for a certain repair job, when there is none at hand to fit the work. The old method of enlarging a mandrel, when found a little too small, was to cover its surface with center-punch marks. I find, however, that the two methods now to be described are far superior to the use of center-punch marks.

In the one shown in Fig. 1 a common knurling tool is used on that part of the mandrel where the close fit is required. The second, Fig. 2, is to roll a series of grooves or corrugations with the corner of a roll, such as is used to finish axle journals. In either method,

the enlarging of the mandrel is supposed to be accomplished without any tempered or casehardened surface, so

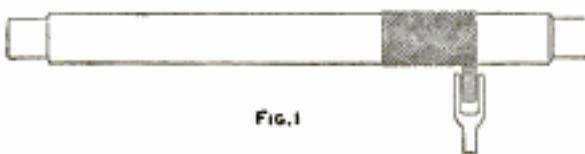


Fig. 1



Fig. 2

Mandrels may be Enlarged a Trifle by Knurling or Rolling Corrugations on Their Surfaces

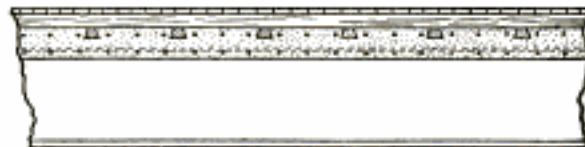
that the metal will be shaped by the rolling process.

The knurling method has been successfully used to enlarge bushings that were turned too small.—Contributed by J. H. Maysilles, Rochelle, Ill.

Wood Top on a Concrete Floor

The accompanying sketch shows a concrete floor designed for use in a yarn mill. The problem was to provide a floor, resting on concrete, to which machinery could be easily and securely attached, says a correspondent of *Industrial Engineering*.

Planed, dovetailed nailing strips, or sleepers, 2 by 3 in., were accurately set with centers 18 in. apart, and concrete was poured around them, so as to completely fill the space beneath, and lock them into the mass of the slab. The illustration shows the sleepers and one system of reinforcing bars in cross section, and also shows how the sleepers were placed, without interfering with the reinforcing scheme, parallel



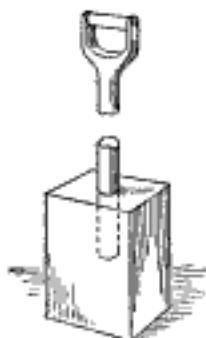
Wood Strips Molded in the Concrete to Make Holders for the Flooring Nails

to the bars of the upper course, and with three bars to each space between sleepers. The ends of the bars were

butted halfway between the sleepers, and they were even nailed thereto with two 4-in. nails at each bearing. On top of the planking, and at right angles to it, was laid a floor of $\frac{3}{8}$ -in. square-edged maple. Machines can be readily and firmly attached to this floor by lag screws. It has a degree of elasticity not possessed by concrete, and is much more comfortable for the workers.

A Homemade Tamper

A serviceable tamper can be made of an old shovel handle and a block of wood. The block can be of any convenient hard wood, about 6 in. square and from 12 to 16 in. long. Bore a hole in one end of the block to receive the round part of the shovel handle. The handle is sawn off, inserted in the hole and securely nailed. The end of the block is covered with a piece of sheet metal.—Contributed by Otto Kling, Ada, Ohio.



Reading Rules from Both Ends

Desk rules and folding rules are made with the figures reading from left to right and sometimes, when measures have to be taken from right to left, it is inconvenient, if not awkward, to read off measurements without error. I have adopted a plan by which the figures on rules can be read either way. With a small plane I cut off the figures on my desk rule and substituted open-faced figures from



The Numerals Marking the Inches on a Rule Run Consecutively Beginning from Both Ends

right to left, to the left of each line indicating inches, and for the reading from left to right full-faced figures were put on, so as to make a distinc-

tion and prevent errors. These two rows of figures could also be made in different colors.—Contributed by R. Roy, Ottawa, Can.

To Fit Loose Piston Rings

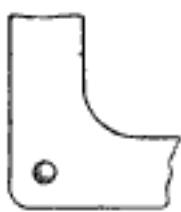
The piston rings in my motorcycle engine became worn so that there was an up-and-down play of about $\frac{1}{2}$ in., causing the engine to knock and lose compression. As I did not care to stand the expense or take the trouble of fitting new rings, I remedied the difficulty in the following manner:

Some thin rings cut from sheet metal were fitted in beside the old rings, care being taken to have them the same diameter to prevent scoring the cylinder. The engine runs as smoothly and quietly as when new.—Contributed by C. F. Rowe, Stephentown, N. Y.

To Keep a Protractor from Soiling a Drawing

Every draftsman realizes how difficult it is to keep drawings clean while working on them. The principal source of trouble is the excess of lead deposited from the pencil, which is spread over the surface of the paper by the triangles, straightedge (or T-square) and protractors. The worst offender in this respect is the steel protractor, on account of its weight and true flat surfaces.

The best way to overcome this difficulty is to decrease the amount of surface contact with the paper. This is accomplished by drilling three small holes in the protractor to receive $\frac{1}{8}$ -in. steel balls tightly. The protractor being only .13 in. thick, the balls will project a trifle on each side. This arrangement gives a minimum surface contact, yet keeps the instrument close enough to the paper to admit of accuracy and speed.—Contributed by J. C. Wilson, W. Lynn, Massachusetts.



Equalizing Clamp for Spring Hangers

A very handy device for use in railroad shops for equalizing spring hangers is shown in the sketch. It is constructed of two bars, $\frac{1}{2}$ by 3 in. by 5 ft., and two crosspieces. The bars have slots, cut to coincide with each other, to receive the crosspieces, which are $1\frac{1}{4}$ by 2 by 7 in. One of the crosspieces is fitted with a screw as shown. This device will clamp a spring hanger



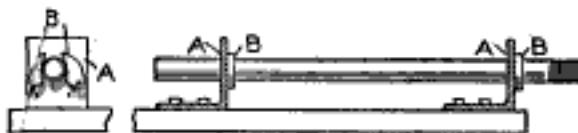
The Bars and Crosspieces in Their Positions as if on a Spring Hanger

and hold it while making necessary repairs.—Contributed by A. A. Att heide, Evansville, Ind.

Homemade Pipe Vise

As I had some pipe to cut and thread and no vise to hold the pipe, I made a temporary arrangement of angle iron that served the purpose well. The two pieces, A A, were cut from the end of an angle iron and holes drilled through one side of each to receive the largest pipe I had to cut. The angle irons were fastened to the bench about 2 ft. apart, with $\frac{1}{2}$ -in. bolts.

Two dogs, B, were attached to each piece of angle iron. Three holes were drilled for each dog so that they could be adjusted to receive and hold smaller pipes. The holes in the angle irons



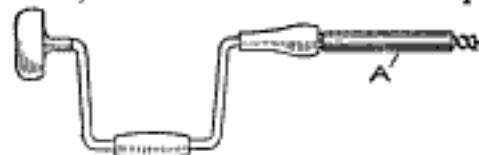
The Pieces of Angle Iron as They are Attached to a Board or Bench

were fitted with bushings for smaller pipes.—Contributed by Stanley S. Zimmy, Harvey, Ill.

An Auger Stop

The stop is made of a piece of pipe, A, that will slip over the bit and of a length to stop the bit when it has entered the material to the desired depth.

This is an effective stop to prevent an auger from passing too far through the material, and also to enable the opera-

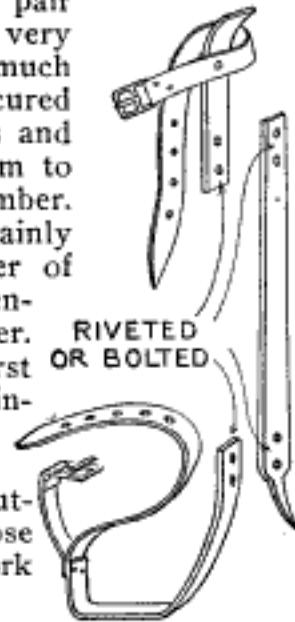


The Stop on an Auger Bit to Prevent It from Boring a Hole too Deep

tor to clean the edge of the hole by continuing to turn the auger after the stop strikes the surface of the material. A few pieces of different lengths and of a size to slip over the bits will be found very useful.

How to Make a Pair of Climbers

Finding myself in need of a pair of pole or tree climbers, I came to the conclusion that a pair could be made very easily without much expense. I procured six old 10-in. files and used three of them to make each climber. The illustration plainly shows the manner of shaping and fastening them together. RIVETED OR BOLTED. The files are first heated and bent into shape, then thoroughly annealed.—Contributed by Ambrose Zierck, New York City.



Aluminum Polish

An emulsion of equal parts of rum and olive oil can be used for cleaning aluminum, says Blacksmith and Wheelwright. Potash lye, not too strong, is also effective in brightening aluminum, and benzol can be used for the same purpose.

A good polish for aluminum consists of a paste formed of emery and tallow, the finish luster being obtained by the use of rouge powder and oil of turpentine.

Lighting a Match in the Wind

The accompanying drawings illustrate two methods of lighting a match in the wind. The match box as shown

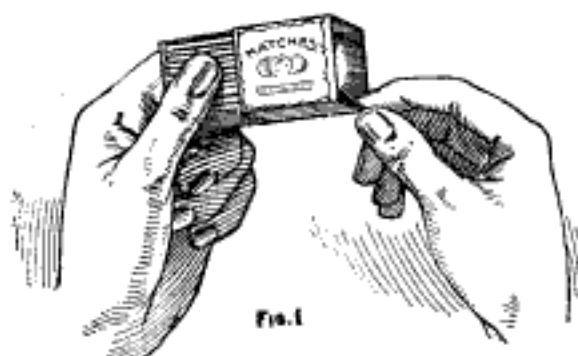


Fig. 1

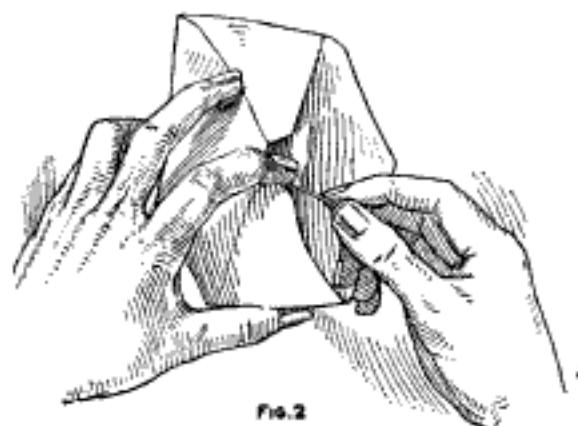


Fig. 2

Two Methods of Keeping the Flame of a Match Burning in a Strong Wind

in Fig. 1 is used as a shield, the thumb being pressed on the head ends of the matches within the box, to prevent igniting them. In Fig. 2 an envelope is used to shield the flame from the wind.—Contributed by James M. Kane, Doylestown, Pa.

Saving Gold with Oil

The fact that oil can be used for the purpose of saving filings and other small particles of gold and other precious metals, in jewelers' shops, is probably not generally known. It can be easily demonstrated by filling a glass half full of water and pouring kerosene on top of the water to a height of about 1 in. If then some very fine gold particles are dropped into the glass, it will be found that they will lodge at the water line.—Contributed by Wendell Rice, Caldwell, Idaho.

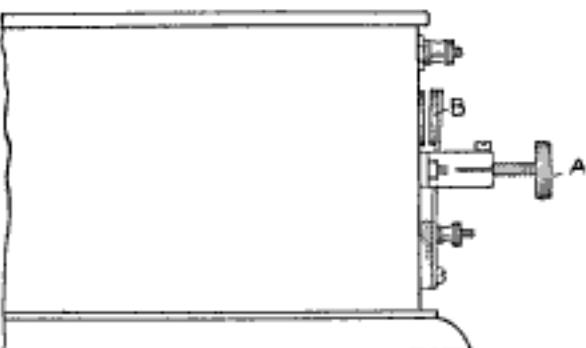
How to Adjust a Spark Coil

A recent careful investigation of a large number of so-called battery complaints on automobiles, led to the discovery that more than 90 per cent of them were due to an improper adjustment of the spark coil. The first thing the average motorist does when his car is not acting right, is to change the adjustment of the coil, and then when no spark is produced he blames the battery, when in reality the cause of the original trouble was elsewhere. A half turn of the adjusting screw on a coil will often increase the current required by the coil from one-third of an ampere up to one and one-half ampere, or nearly five times the actual current required.

A wrongly adjusted coil will cause one or more of the following cases of trouble: Great reduction in useful life of the batteries; rapid deterioration of the contacts on the coil; unsatisfactory operation of the motor; general dissatisfaction on the part of the operator.

Adjust the coil according to the following directions, and do not allow anyone to change the adjustment for any reason whatever:

First, remove the vibrator contact screw, marked A in the accompanying illustration. Second, smooth the point of the screw A and the platinum surface on the vibrator spring with a very fine file or a piece of very fine emery paper. Third, adjust the vibrator spring so



End of the Spark-Coil Box with the Vibrator Parts and Binding Posts for the Line

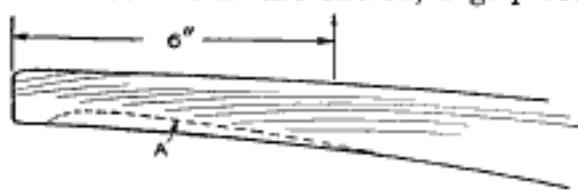
that the hammer or piece of iron on the end of the vibrator spring stands normally about $\frac{1}{8}$ in. from the end of

the coil. This piece of iron is marked B in the illustration. Fourth, turn in the contact screw until it just touches the platinum contact on the vibrator spring very lightly, then start the engine and if it misses, tighten, or turn in the contact screw corresponding to the cylinder that is missing, just a very small amount at a time, until the engine runs without missing explosions.

If the carburetor is properly adjusted and the coil windings and circuits are in good shape, there will be an ample spark with the smallest possible consumption of battery energy. A high-grade coil will usually save its price in one season, through the economy effected in batteries.

Handle Shapes for Wheelbarrows

If the handles of a wheelbarrow are altered to the shape shown by the dotted lines AA in the sketch, a grip for



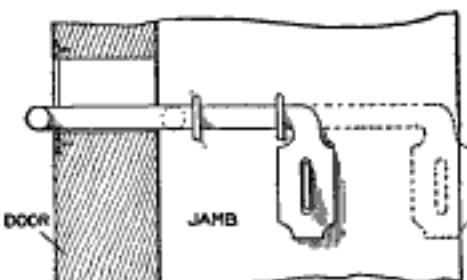
The Handles are Dressed to a Shape Similar to That of an Ax Helve, Producing a Knob on the End

the hands will be provided that greatly assists the laborer and causes fewer blisters than the ordinary handle.

The cause of its superiority seems to be the knob on the end which is similar to that on an ax helve. The tops of the handles are left untouched, the sides are sheared off for about 6 in. so as to give them an oval instead of a circular cross section. The under side is still more changed. About $\frac{3}{4}$ in. from the end of the handle the wood slopes sharply, showing a difference in circumference of about 1 in. between the knob and the smallest part. From this point it gradually slopes to the normal size at about 6 in. from the end.—Contributed by S. H. Packard, Boston, Mass.

A Sliding Door Lock

A very simple sliding door or gate lock that has been used with satisfaction is shown in the illustration. This



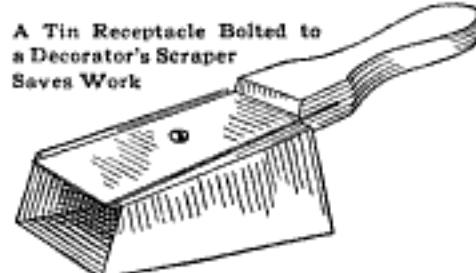
The Bent End on the Bolt Holds the Door Tightly against the Jamb When in a Locked Position

lock has a feature that is not found in most locks of this character—that of keeping the door tightly against the jamb besides locking it. The illustration shows the bolt in a locked position ready to receive a padlock.

To operate the lock, lift the hasp from the staple bringing the bent end of the bolt in line with the slotted hole in the door. This will allow the bolt to be drawn through and left in an unlocked position, as shown by the dotted lines.—Contributed by W. H. Wake, Paterson, N. J.

A Cup on a Decorator's Scraper

When washing or scraping walls, ceilings or other surfaces previous to redecorating, the refuse is usually allowed to fall anywhere, so that considerable cleaning and scrubbing of the floors become necessary. If the little device shown in the sketch is attached to the scraper, it will catch all the scrapings and keep the rooms tidy for



the decorator. The device can be made of a piece of tin and attached to the scraper with a stove bolt.

Renewing Fuse Plugs

Having a number of fuse plugs on hand which I desired to renew, I first removed the old rivet at the bottom of the plug and put in a piece of fuse wire, A, with a split rivet, C, soldered to it at B. It is only necessary to bend the fuse wire over and solder the other end as shown in D, and the plug is as good as new. A number of these fuse wires with rivets attached are kept ready, and one of them can be attached in a short time.

—Contributed by W. C. Heidt, Chicago.

Holder for a Barn Door

A door hung on rollers is easily kept open or shut, as the case may require, by notching the track, as shown at A in the sketch, to fit the circumference of the wheel. The door will remain at the point of the notch when the wheel sinks into the notch, but it can also be easily pushed over the depression in opening or closing the door.—Contributed by Earl R. Hastings, Corinth, Vt.

Stopping a Weld

A weld can be stopped at any point by placing a piece of paper in between the pieces just before they are brought to a welding heat. The metal will



A Piece of Paper Placed between the Red-Hot Parts will Stop a Weld at Welding Heat

not run together where the paper is placed.—Contributed by A. S. Thomas, Gordon, Ont.

Disinfectants for Various Articles

A deodorizer is not necessarily a disinfectant as well, nor is the reverse true. Strong-smelling substances are not usually the best disinfectants. The germicides or disinfectants best suited for some particular purposes, are given herewith.

Bedsteads—Hot carbolic acid or corrosive sublimate. The carbolic acid should be 5-per-cent, and the corrosive sublimate, a 0.001-per-cent solution.

Bedding—Steam them, boil, or use a strong formalin solution.

Brushes and Brooms—Those of a good grade may be steamed or boiled, while the cheaper ones should be washed in strong alkaline soap and soaked in carbolic acid of 5-per-cent strength.

Books—Put them in a closed place and treat with formaldehyde gas.

Dead Bodies—Wrap in sheets wet with corrosive sublimate, carbolic acid, or tricresol.

Clothing—Steaming, boiling or exposing to formalin gas is good.

Carpets—Steam them, or sprinkle formalin under them.

Draperies—These should not be allowed to remain in a sick-room. If they have been exposed to infection, they should be boiled; but if such treatment would ruin them, nothing remains to do but burn them.

Floors—All floors should be washed well with carbolic acid (5-per-cent) and corrosive sublimate (0.001-per-cent) or tricresol.

Furniture, etc.—Formaldehyde gas is good. Glassware should be boiled. Leather, skins, and other articles being partly made thereof, should be washed in a 5-per-cent carbolic-acid solution. Money, paper or coin, may be boiled, and as it is often very badly contaminated, this should not be overlooked.—Contributed by Loren Ward, Des Moines, Iowa.

Pulverized or floss asbestos, mixed with a little plaster of Paris and water, makes a good paste for stopping holes in stoves.

How to Build a Greenhouse

By PHILIP L. MCKEE

A summer garden patch affords pleasure and profit to many people and almost everybody has either owned, or worked, or helped to work such a garden, but how many people know about the "winter garden patch." It is just as easy to grow lettuce, radishes, tomatoes, cucumbers, melons and even flowers during the winter as it is in the summer if you have a small hothouse, or greenhouse.

It is surprising what can be done with just a small greenhouse. A house, 10 ft. wide and 20 ft. long, will produce all the vegetables an average family will use during a winter season, and enough over to pay much of the expense of growing. In addition to the vegetables a great many flowers can be grown, and the greenhouse affords an excellent place for storing the house plants in the cold winter months. It will be a good place to put the geraniums, the rubber tree, the ferns and such other plants as it may be desired to keep.

The pleasure side of the greenhouse is very attractive to those who enjoy watching things grow. The work is very interesting and instructive; it brings one close to nature, and the lessons learned are from first-hand sources.

Owing to the high cost of living the profit side will probably be of most importance, and let it therefore not be overlooked that a house of the size mentioned will surely pay a dividend above the stock of vegetables for the table, if it is given just ordinary care and attention. The commercial vege-

table grower, the man who grows for the market, figures a clear profit of 50 cents for every square foot of growing space in his greenhouses, and at this rate a house 10 by 20 ft. would net \$75.00 above expenses. The house be-



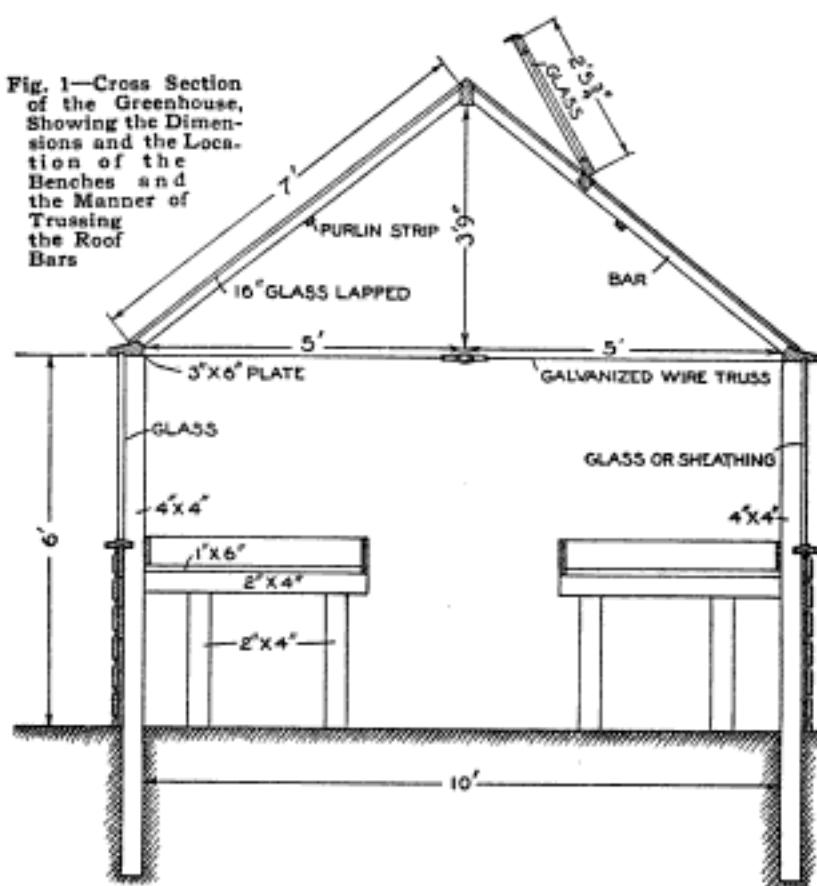
A Small House with a Floor Space of 200 Sq. Ft. will Produce All the Vegetables a Small Family can Use During the Winter Months

ing small, the expenses will be greater in proportion to the quantity of vegetables produced, but on the other hand, they can be sold direct to the consumer at far better prices—probably twice as much as the truck gardener gets.

Anyone who is at all handy with tools can erect the house and put in the heating system. The materials can be had from the manufacturers who

make a specialty of this line of work, at very reasonable prices, or they can be made by some local planing mill.

Fig. 1—Cross Section of the Greenhouse, Showing the Dimensions and the Location of the Benches and the Manner of Trussing the Roof Bars



Cypress is the best wood to use, but if this cannot be had, a good grade of pine or fir will do. The heating system should be either hot-water or steam, the former preferred.

How to Commence Work

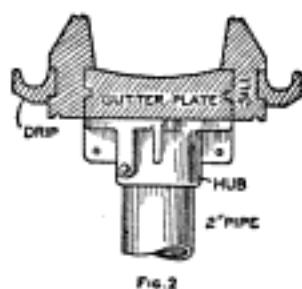
The tools needed to complete the entire house are the following: Saw, hammer, level, square, homemade miter box, 18-in. pipe wrench, 12-in. monkey wrench, pipe cutter and a pipe threader that will thread pipe up to 2 in. in size. If all of these tools are not at hand, they can be purchased for little money new, and very cheap second hand. It may also be possible to borrow one or two for a day or so, thus saving some of this expense.

The sketch, Fig. 1, showing cross section, will give a good idea of how the house is to be framed and of its general features. By carefully studying this drawing anyone should be able

to understand it without difficulty. For a house of this size the posts, Fig. 2, for the walls should be of 2-in. pipe, as this makes the best wall and gives the neatest appearance, but they can be of wood, Fig. 3, if pipe is not easily had at a reasonable cost. If wood posts are used, they should be square and planed on all sides so paint can be applied easily and to give a nice appearance. If round posts are the only ones to be had, a slab should be taken off on one side to give a nailing surface for the sheathing of the wall. The kind of posts to be used, should be decided, the posts made ready, the post holes dug, a brick or piece of stone put at the bottom of the hole and the posts set in place. These posts should be set 3 ft. deep

in the soil and placed 5 ft. 2 in. apart, center to center. After the first line is set for the proper length of the house, carefully set the line for the width. If pipe posts are used, be careful when setting them to get the tops all in line and level. If the posts are wood, they can be sawn off in line after they are firmly tamped in place in the soil. A good height for the walls is 6 ft., but they may be lower or higher just as desired. Of course in setting posts, they must be arranged for pitch for the water to drain

off in the gutter, unless an eave plate is used, in which case the wall should be level. Give all the material two



coats of paint before erecting the house, using white lead and oil or a good mixed paint.

Framing the Roof

After all the posts are set, they are ready for the roof framework. If the posts are of pipe, an iron flange or casting must be used on the top for fastening the eave plate or gutter in place; if wooden, simply nail the plate or gutter in position, using three 20-penny spikes at each post.

The gutter or plate may be made as shown in Fig. 3, or in any other suitable manner. After this has been done, the roof bars and the ridge should be put up. The bars should be rabbeted on each side as shown in Fig. 3, and the ridge should have a groove in each side for the glass to fit into.

Nail one bar on each side of the ridge at each end and then set in place so that the lower end of each bar rests in position on the eave plate or gutter. Nail the lower ends fast, using one 6-penny finishing nail on each side of the bar and a 4-penny on top through the tongue of the bar. Nail the intermediate bars in place, being careful to space them the proper distance apart. Mark off the places for the bars on the ridge and at the eave, or cut a small block of wood $\frac{1}{16}$ in. longer than the width of glass being used and use this as a template for spacing the bars.

When the bars are in place, fasten the hinges to the ventilator sash to be used at the top of the roof. Hinge the sash in position on the roof (Fig. 4), first nailing the little header pieces between the bars as a stop for the glass in the rows just below the ventilators.

The roof can now be glazed. Use good putty, running it along the glass rabbet on the bars with the fingers, and bedding the glass down tightly into it. Start at the lower end of the bar and work toward the ridge giving the lights of glass a lap of $\frac{1}{8}$ to $\frac{1}{4}$ in. Use one single light between the bars in the ventilators if possible, but if not, give the glass a lap the same as on the roof. Fasten the lights in place with $\frac{3}{4}$ -in. No. 16 galvanized brads or brass shoe nails, and then scrape off

the surplus putty from underneath the glass. Do not use putty on top of the glass as in glazing sash for a residence. A good size of glass to use is 16 by 18 in.

Gable Ends and Sides

One gable end should be glazed and the other should adjoin the residence, barn or other building in which the

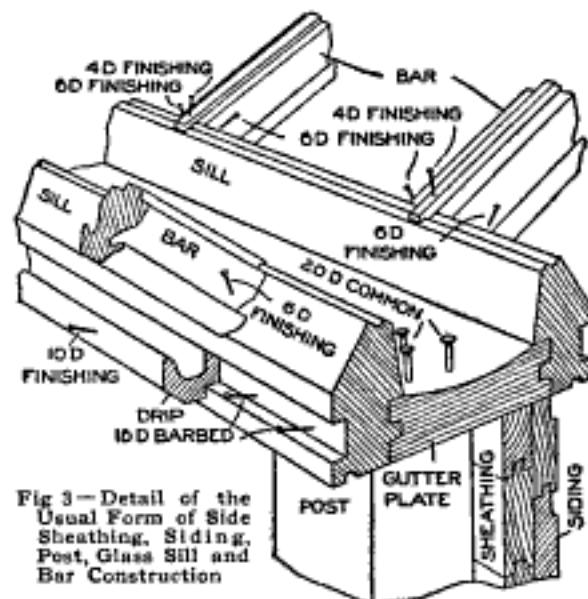


Fig. 3—Detail of the Usual Form of Side Sheathing, Siding, Post, Glass Sill and Bar Construction

small heater is located that is to keep the greenhouse warm. For the glazed end use wood posts and, if desired, put in a door frame made of 2 by 4-in. studs, and a small door. Cut off the upper ends of the upright glazing bars for the end, to suit the pitch of the roof, using the miter box for this work. Glaze in the same way as the roof, but just butt the lights of glass end to end in place of giving them a lap as before.

For the walls it will be cheaper to have sheathing from the ground to the eave, but, if desired, glass can be used in one wall to get light (Fig. 5). If the house is placed east and west, use glass in the south wall. If pipe posts are used, it will be necessary to first fasten a 2 by 2-in. piece on the outside to get a nailing surface for the sheathing. If the wall is to be boarded up solid, the post blocking will run full height, but if glass is used, it will be only long enough for the height of the sheathing.

For glass in the wall a sill is necessary for the side bars to rest on, and

it should be beveled to shed the water. Nail the side bars to this sill and to the eave, just as for the roof bars and

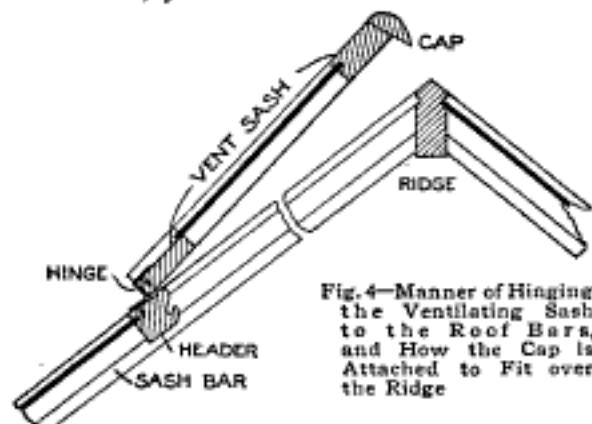


Fig. 4—Manner of Hinging the Ventilating Sash to the Roof Bars, and How the Cap is Attached to Fit over the Ridge

glaze in same manner as for the gable end.

Nail the sheathing with 8-penny common nails. Use any common lumber for first sheathing, but have it a different width than the second, or outside sheathing, so the wall will be tight. After the first sheathing is on, use a layer of good building paper and then cover it with drop siding or clapboards. The sides and ends should be boarded alike and corners finished off by nailing the pieces upright to conceal the joint.

Benches or Tables

These can be built of common rough, pecky cypress or hemlock, using 1 by 6-in. and 2 by 4-in. material. Benches should be 36 in. high from the ground to the top. Make the legs of 2 by 4-in. material, cut 2 ft. 6 in. long, and nail them on the end of the crosspieces, cut of same material to the right length for the width of bench. The 1 by 6-in. pieces are used for the bottoms and sides. They should be placed about $\frac{1}{4}$ in. apart for the bottom to allow for drainage. Benches should be level. Set the legs on bricks to prevent settling. For the house described use two benches, each about 3 ft. 8 in. wide.

Heating

This house, 10 by 20 ft., will require only a small amount of radiation and can be heated by a medium-sized hot-water laundry stove. This heater should be set about 3 ft. lower than

the greenhouse floor, if possible. If necessary it can be placed on the same level but this will not produce a good circulation throughout the system.

From the heater run a 2-in. flow pipe into the greenhouse just beneath the ridge, or along under one of the eaves, carrying it to the far end of the house. At the far end take off two branches, one on each side, of 1½-in. pipe, leading to the return pipes under the two benches. To get an inside temperature of 60 deg., at zero outside, 9 lines of 2-in. pipe are needed for this house, or 11 lines of 1½-in. pipe. After deducting the 2-in. flow pipe there are 8 lines of 2-in. pipe to put under the benches, four on each side, or 10 lines of 1½-in. pipe, using five on each side. The lines of pipe under the benches can be made up with manifolds or tees and nipples. On the near end of the greenhouse two 1½-in. branches will again connect the coils to a 2-in. pipe for the main return. For steam use one 1¼-in. flow pipe and six lines of 1¼-in. returns, three on each side, with a 1-in. pipe for the main return.

About Buying Materials, etc.

The best plan will be to get the materials from a greenhouse manufacturer as the cost will be less and every-

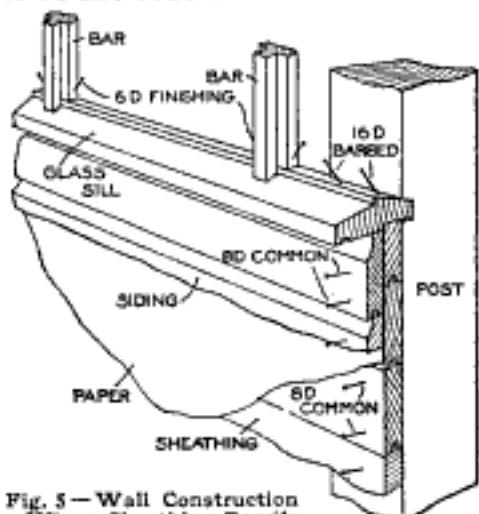


Fig. 5—Wall Construction Where Sheathing Boards are Used on the Bottom Part and Glass above the Benches

thing can be had cut and fitted ready to be set in place. He will also furnish plans and printed instructions telling how to erect everything, and thus time and money will be saved.

Scraper for Brass Work

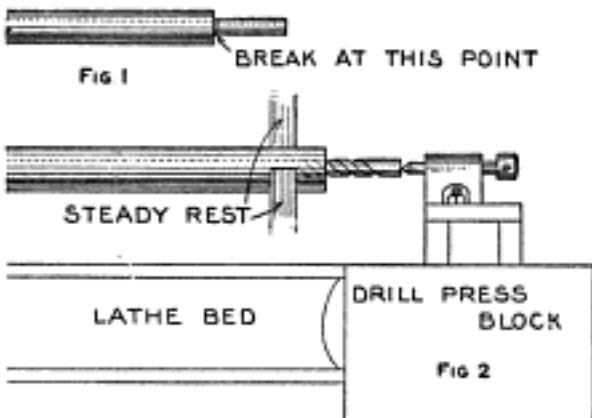
When scraping brass boxes and other brass or bronze parts with the ordinary scraper, it will be observed that the tool digs in and makes rough work or chatter marks. This is due to the nature of brass which demands that, to cut smoothly, any tool, whether hand, or for use in a machine or drill, must have a straight top face or negative rake. A good brass scraper may be made from any flat or square file by simply grinding off the teeth, leaving the edges square. In use, the back edge should rest on the work as well as the straight edge, thereby lending support to the tool and helping to cut smooth.

Boring and Turning Long Pieces

I inclose a drawing illustrating how to bore and turn a piece longer than the lathe, or, at least, the way I did one long job.

There came into the shop one day a roll that had a broken journal, as shown in Fig. 1. There was a "hurry up" tag on the piece. When clinched, the roll, minus the journal, was as long as our lathe; so no help from the tailstock or carriage could be looked for. So we moved the table, or block, of the radial drill over to the end of the lathe and fastened it snugly. As it weighed 500 lb., it only needed wood

clamps to keep it from pushing away. Then a planer center was mounted on parallel blocks, as in Fig. 2, and the end drilled out for a tap the size of the broken journal. After hand tapping



The Extension on the Lathe Bed Forms a Block to Hold the Tailstock of the Lathe

the journal hole, a new piece was screwed in very tightly—a piece with the free end slightly larger than the required finished size. Then a compound rest from another lathe was bolted to the block, a center put in the new end, the planer center run into this, and the journal turned off to size, using the hand feed in the compound rest. This job might have been done in other ways, but the one illustrated was, under the circumstances, fairly quick and accurate and saved sending the piece to a shop having larger tools.

—Contributed by D. A. Hampson, Middletown, N. Y.

Cold-Storage Temperatures

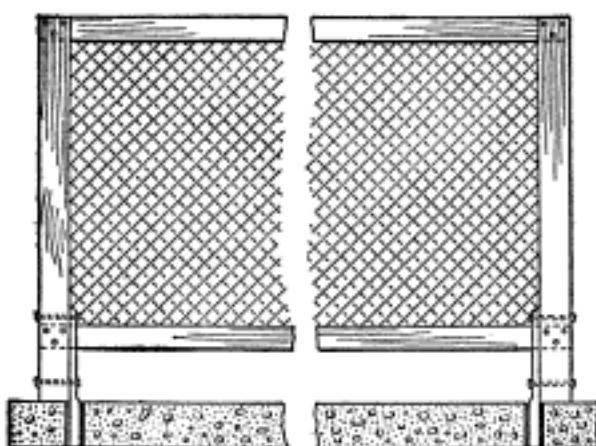
In the following list is given a number of articles together with the

approximate temperature, in degrees Fahrenheit, at which each is best kept:

| | | | | | | | |
|--------------|----|----------------|----|--------------------|----|-----------------|----|
| Ale | 33 | Cheese | 34 | Honey | 38 | Pears | 35 |
| Apples | 35 | Cider | 33 | Hops | 36 | Pork—fresh | 32 |
| Asparagus | 34 | Cigars | 35 | Lard | 32 | —salt | 36 |
| Bananas | 35 | Dates | 30 | " oil | 40 | Porter | 33 |
| Beet—fresh | 35 | Eggs | 32 | Lemons | 36 | Potatoes | 36 |
| " —salt | 36 | Fruits—dried | 38 | Livers | 35 | Parsnips | 34 |
| " —dried | 40 | Fish—dried | 35 | Maple syrup | 40 | Sauerkraut | 35 |
| Beans | 36 | " —fresh | 28 | Milk | 34 | Sausage Casings | 20 |
| Beer | 33 | Flours | 40 | Nuts in shell | 36 | Sheep | 32 |
| " bottled | 45 | Furs | 32 | Onions | 33 | Sweet Corn | 35 |
| Berries | 36 | " undressed | 35 | Oleomargarine | 20 | Syrup | 33 |
| Butter | 20 | Game to freeze | 15 | Oranges | 36 | Tenderloins | 33 |
| Cantaloupes | 35 | " after frozen | 28 | Ox Tails | 30 | Tobacco | 35 |
| Carrots | 34 | Ginger Ale | 37 | Oysters in shell | 32 | Tomatoes | 35 |
| Celery | 34 | Grapes | 35 | " in tubs | 25 | Walnuts | 35 |
| Cabbage | 33 | Hams—brined | 36 | Poultry scalped | 20 | Watermelons | 34 |
| Calves | 33 | " not " | 20 | Poultry dry picked | 28 | Wines | 45 |
| Canned Goods | 35 | Hogs | 30 | Peaches | 35 | Woolens | 32 |

A Machinery Guard

The accompanying sketch shows how a guard to set around machinery may be made. It was designed by a correspondent of Power. The posts



The Frames Have Metal Posts That Fit into Metal Tubes Set in the Concrete Floor

are of $1\frac{3}{4}$ by 4-in. dressed hard wood. The side strips are $\frac{3}{4}$ by 3 in. and of the same material. For a 6-ft. wheel the frame is made 6 ft. long, 4 ft. 4 in. high, and the lower side strip is set into the posts with its lower edge 8 in. above the floor. The top strip is fastened to the top of the posts as shown.

The floor irons are made of $1\frac{1}{4}$ -in. pipe, cut to the desired length, and after the concrete floor has been drilled, the $1\frac{1}{4}$ -in. pipe sleeves are set and cemented in place. The irons used on the frames are of 1-in. pipe, drawn out flat for about one-half their length. Holes are drilled in the flattened part for $\frac{1}{4}$ by $2\frac{1}{2}$ -in. carriage bolts to secure them to the frames. After the frames are made, they should be painted to match the color of the engine, and, when dry, they are covered with steel-wire fencing, 48 in. wide. When any work on the machinery is required, the frames can be removed without leaving any projections on the floor.

A very effective fish bait is made by inclosing a live minnow in a short section of glass tube, which is filled with water and both ends closed with corks. Fasten this to the line in place of the spoon.

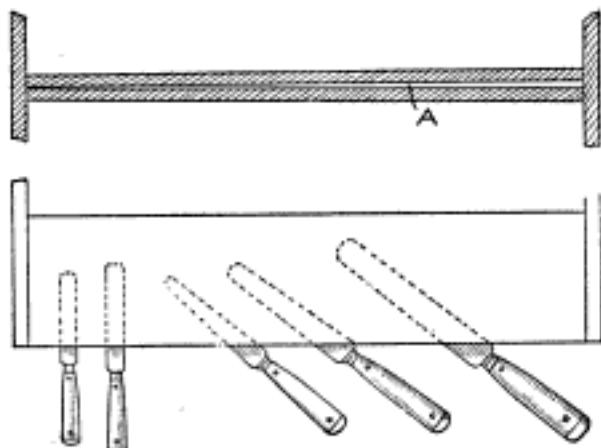
An Effective Screwdriver

When a screw cannot be turned with an ordinary screwdriver, the following method is usually successful. Put the cutting edge of a cold chisel in the slot of the screw head and slightly turn the chisel in the direction to loosen the screw. This will cause the chisel to "climb" out of the slot a trifle. Hit the head of the chisel a light, sharp blow which will cause it to bottom in the slot, but the inertia of the chisel in turning to its original position will cause the screw to turn a small amount in the desired direction. By repeating this several times the screw can be loosened so it is easily turned with a screwdriver.—Contributed by C. A. Gilson, E. Lansing, Mich.

A Spatula Holder

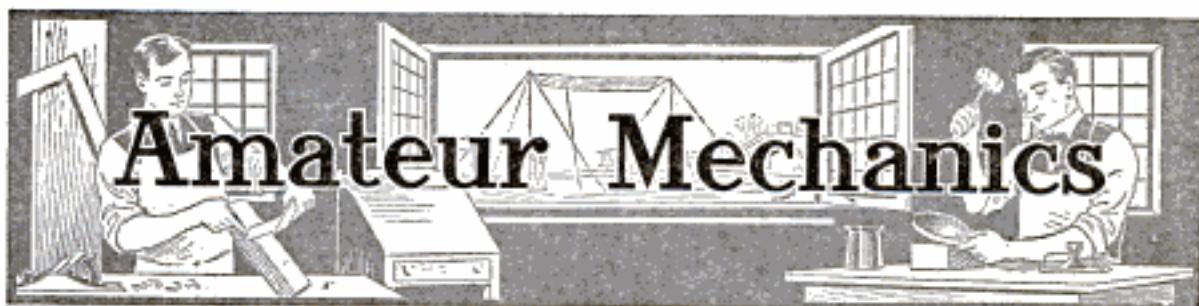
A druggist desiring to keep his spatulas bright and clean made a place on a shelf as shown in the illustration. It is simply two shelves placed close together, with the space A between them slightly tapering from one end to the other. Before fastening the shelves in place the surfaces facing each other were covered with fine emery cloth.

After using a spatula, it is wiped clean, then run in and out the space



The Tapering Space between the Shelves is Lined with Fine Emery Cloth on Both Sides

where it fits most closely. This will keep it bright and clean, and it may then be left in the opening until needed again.



To Hold a Negative in a Printing Frame

When printing postal cards and working fast, it always bothered me to hold the negative in the printing frame while removing the card. To overcome this trouble I decided to contrive some arrangement to hold the negative in the frame when the back was removed. The device I made consists of a thin, flat spring, about $\frac{1}{8}$ in. wide and as long as the width of the frame opening. Two lugs are formed and soldered to the ends, as shown in Fig. 1, for holding the plate, and a central lug is soldered on to provide a means of fastening the spring in position. A groove, about $\frac{1}{16}$ in. deep, was cut in the opposite end of the frame to receive one end of the negative.

In use, slide the plate into the frame and into the lugs on the spring, and push the spring upward until the plate can be slipped into the slot at the opposite end of the frame. The pressure of the spring, as shown in Fig. 2, will hold the plate securely. The



FIG. 1

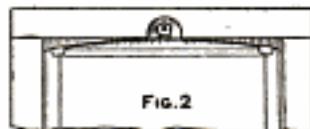


FIG. 2

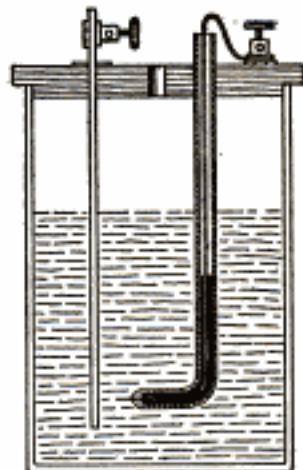
The Spring with Its Clips and Manner of Holding a Negative in a Printing Frame

frame can be handled quite roughly and as fast as desired without any danger of the plate falling out.—Contributed by Thos. L. Parker, Wibaux, Montana.

CA number of bright tin disks tied to the limbs of a fruit tree will prove an efficient means of driving away infesting birds.

How to Make an Electrolytic Interrupter

Obtain a glass jar or wide-mouth bottle about one-quart size. An ordinary round bottle will serve very nicely by having the top cut off, thus forming a glass jar. Make a top for the jar from a piece of $\frac{1}{2}$ -in. pine similar to the one shown in the illustration. The lower portion extends down inside the jar and serves to hold the top in place. Cut a slot in this top, $\frac{1}{8}$ in. wide and 2 in. long. This slot should be cut at right angles to a diameter of the top and extend 1 in. on either side of the diameter. It should be about $\frac{1}{2}$ in. from the center of the top. Directly opposite the center of the slot drill a $\frac{3}{8}$ -in. hole, $\frac{1}{2}$ in. from the center of the top. Drill a $\frac{1}{4}$ -in. hole in the center of the top to give ventilation to the jar. Boil the completed top in paraffin for a few minutes.



Obtain a piece of $\frac{1}{8}$ -in. sheet lead, 2 in. wide and about $\frac{1}{2}$ in. longer than the depth of the jar. Mount a small binding post on one end of this piece of lead and then support it in the slot in the wooden top by means of two metal pins. The lower end of the piece of lead should be at least $\frac{1}{2}$ in. from the bottom of the jar. Next get a piece of $\frac{3}{8}$ -in. glass tube and fuse a piece of platinum wire into one end.

Make sure the inside end of the platinum wire is not covered with the glass, and that the outside end protrudes a short distance beyond the end of the glass tube. Now bend about $\frac{3}{4}$ in. of the end of the glass tube which has the platinum in it over at right angles to the remainder of the tube. The tube should then be placed in the opening on the wooden top provided for it and a rubber band placed around it to prevent it dropping through the opening. The lower end of the tube should be a little higher than the lower end of the sheet of lead. A small quantity of mercury should be placed in the tube and a bare copper wire run down inside. The mercury affords a connection between the piece of platinum in the end of the tube and the copper wire. Connect the outside end of the copper wire under a binding post and

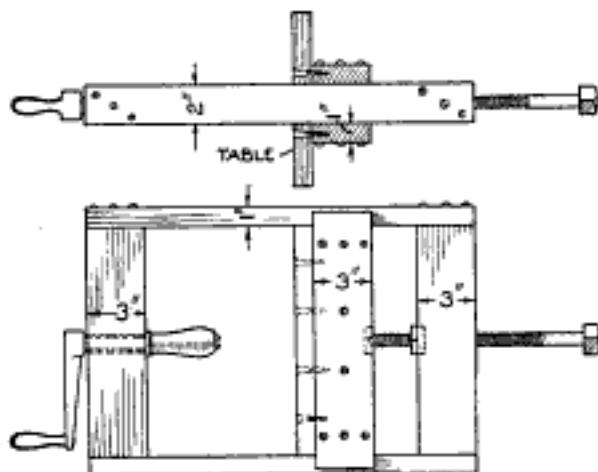
the interrupter is complete with the exception of the solution.

The solution for the interrupter is dilute sulphuric acid made by mixing about four parts of water and one part of acid. In preparing this mixture, be sure to pour the acid into the water, not the water into the acid. The jar should be about two-thirds filled. At least 40 volts will be required for the satisfactory operation of the interrupter. The distance between the platinum point and the lead sheet may be adjusted by simply turning the glass tube.

No condenser will be required in operating an inductor coil with an interrupter of this kind. The make-and-break interrupter, if there is one in circuit, should of course be made inoperative by screwing up the contact point against the spring.

A Homemade Hand Drill Press

The little use I had for a drill press did not make it advisable to purchase one, so I constructed a device for drilling iron and brass which answered all purposes. A broken carpenter's brace furnished the chuck, which was fastened to a $\frac{1}{2}$ -in. shaft having a detachable crank. The shaft turns in a



A Very Inexpensive Drill Press Frame Which Answers the Purpose Admirably

brass tube which is fitted tightly in a hole bored in the upright. The sliding part or table is forced up against the drill with a $\frac{1}{2}$ -in. machine bolt.

The bolt turns in a square nut fastened in the opposite post. The end of the screw bears on a plate fastened on the under side of the table to prevent wear. A crank could be attached to this bolt so that it may be turned more easily.

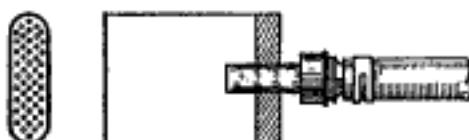
The sliding or table part is made of a post similar to the end posts, but with guides attached so as to keep it in place. The holes for the chuck shaft and bolt should be bored on a line and exactly in the center of the posts.—Contributed by L. R. Kelley, Philadelphia, Pa.

A Hose Nozzle

The nozzle shown in the accompanying sketch was made from an empty tobacco can having an oval shape. I cut the can in two near the center and punched small holes in the bottom. I then cut a piece of $\frac{1}{2}$ -in. board to fit tightly in the end of the can and turned the edges of the tin down to hold it in place. A hole was bored in the center of the wood and a $\frac{1}{2}$ -in. hose coupling fitted in it. The water will swell the wood enough to make an absolutely watertight joint, but by using a

little care in fitting it, the joint will be watertight without the swelling.

The holes being punched in straight lines, the nozzle throws a rectangular section of fine streams, which makes it possible to sprinkle close up to walks without wetting them. The friction is much less than in the ordinary hose nozzle, and consequently this nozzle delivers more water and also materially



The Oval Form of the Box Makes It Possible to Sprinkle Close Up to Walks

reduces the strain on the hose.—Contributed by J. B. Downer, Seattle, Washington.

An Electric Water Heater

A simple electric water heater may be made as follows: Procure two sheets of copper, each 4 by 6 in., and place pieces of wood or other insulating material at the corners to keep them about $\frac{3}{4}$ in. apart. Bind them with cords, or, if the wood pieces are large enough, use screws so that there will be no contact between the plates. Attach wires to the plates with solder as shown, and make connections to a plug. Pour water in an earthenware



An Inexpensive Electric Water Heater Made of Two Copper Plates

jar, place the plates in it and turn the plug in a lamp socket. Do not use a metal vessel.—Contributed by G. Henry Jones, Sylacauga, Ala.

Frosting Glass

Procure a piece of flat iron similar to an iron hoop, bend it, as shown in the sketch, to make a piece 3 in. long and $1\frac{1}{4}$ in. wide and file one edge smooth. Sprinkle some fine lake sand over the glass, dampen the sand and rub the

smooth edge of the iron band over the glass. It requires only a short time of



The Filed Edge on the Coiled Metal Retains the Sand Particles as It is Rubbed over the Glass Surface

rubbing to produce a beautiful frosted surface on the glass.—Contributed by M. E. Duggan, Kenosha, Wis.

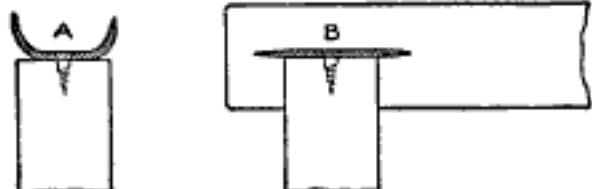
Long Handle for a Dustpan

The dustpan is a rather unhandy utensil to use, especially for stout persons. One porter overcame this difficulty by attaching a long handle to the pan as shown in the illustration. The handle was taken from a discarded broom and a yoke of heavy wire was attached to it, the ends being bent to enter holes punched in the upturned edge of the pan. A stout cord, fastened to the handle and tied into the ring of the dustpan handle, keeps the pan from turning backward, and it is thus possible to push it or carry it with the long handle.



To Fasten Chair Legs

Chair legs often become loose when chairs are handled roughly, so that the glue is broken up. A small device made from a piece of pointed metal, A, which is securely fastened to the end of the chair leg by means of a screw, will hold the legs more firmly than wire or glue. When the

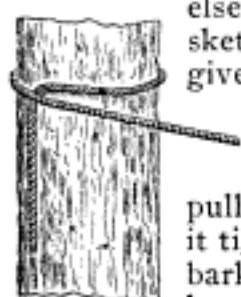


The Metal on the End of the Leg Fastens It Solidly in Place

leg is driven into the hole, the points are pushed into the wood B as the metal flattens.

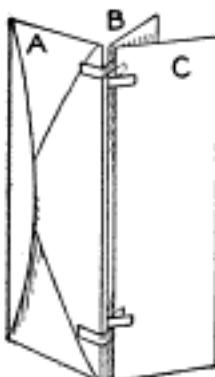
To Tie a Hammock

A method not generally known to quickly and securely hitch up a hammock between two trees, in camp or elsewhere, is shown in the sketch. Each end rope is given one or more turns around a tree trunk and then tucked under, as shown. The pull on the rope will draw it tightly against the rough bark on the tree. The harder the pull, the tighter the rope binds against the tree trunk. In this manner a hammock can be put up in a few moments and it is as readily taken down.—Contributed by Bert Morehouse, Des Moines, Iowa.

**An Inexpensive File**

Envelopes make a very inexpensive as well as a neat file for papers and letters if they are arranged and fastened together so that they can be kept in one packet. In making such a file procure as many envelopes as there will be headings in the file, also a number of strips of gummed tape, about $1\frac{1}{2}$ in. long. There must be twice as many of these strips as there are envelopes.

Bind the backs of two envelopes, A and B, together leaving a space of $\frac{1}{8}$ in. between the envelopes. Bind a



The File is Built Up of Envelopes Joined Together with Small Strips of Tape

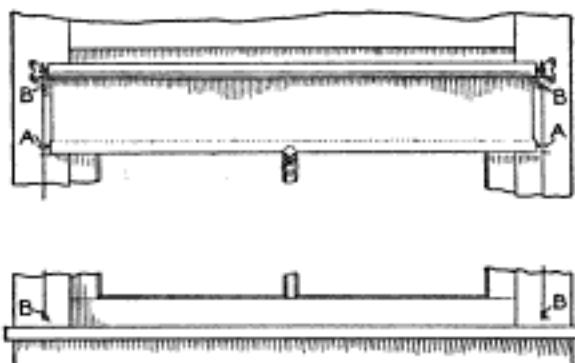
third envelope, C, to B, and so on. The strips of tape from A to B and from B to C are on opposite sides of the envelope B. Continue binding un-

til the required number of envelopes have been joined together. Assign a heading to each of the envelopes, and the file is ready for use. When completed it should appear as shown in D.—Contributed by Alfred Rice, Syracuse, N. Y.

Window-Shade Guides

The annoyance of a shade that will not run true on the roller and flops in the wind coming through an open window can be overcome by using guide wires as follows:

The stick in the hem on the lower edge of the shade is supplied with a screw eye, A, at each end. A wire is run through the screw eye and fastened in a vertical position on the casing

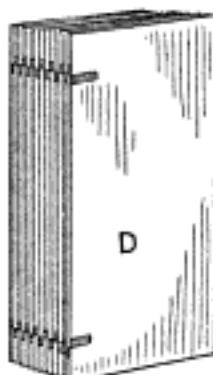


Two Parallel Guide Wires Hold the Stick of the Shade in Its Proper Place

with screw eyes as shown by B, B. A second wire is similarly attached on the other side of the shade, taking care to have both wires parallel and true with the ends of the roller.—Contributed by George Lue, San Francisco, California.

Watering Plants at the Roots

An effective way to water rose bushes, shrubs or plants is to place an old cowhorn in the earth so that the small end will be near the roots of the plant and the large end level with the surface of the ground, and fill the horn with water. The small end of the horn should be cut off at such a point that the hole will be about the size of a lead pencil.—Contributed by Chas. L. Richards, Philadelphia, Pa.



How to Make a Dry Cell

The containing vessel for the cell should be made from sheet zinc. It should be cylindrical in form, approximately $2\frac{1}{2}$ in. in diameter and 6 in. long. This vessel is to form the negative terminal of the cell and a suitable connecting device, similar to the one shown in the sketch, should be provided and securely fastened to the upper edge of the vessel. The vessel should be lined with some heavy blotting paper, both sides and bottom.

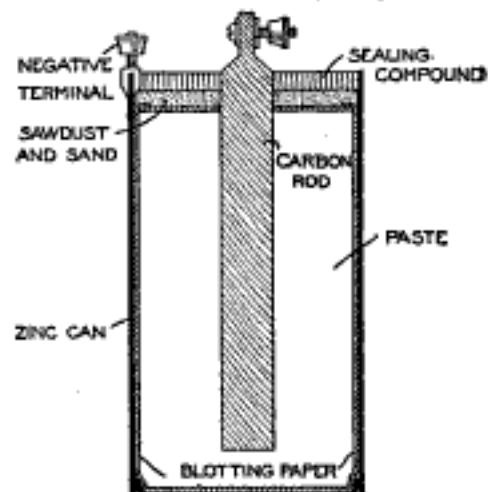
Place into a glass jar a small quantity of chloride-of-zinc crystals, and pour over them $\frac{1}{2}$ pt. of distilled water. Allow the crystals to dissolve at least one-half hour. If the crystals all dissolve, add more until some remain in the bottom of the jar, or until the liquid is saturated. Pour off the solution and dilute it by adding an equal part of distilled water. Add to this solution sal ammoniac, in the proportion of 1 lb. of sal ammoniac to every 2 qt. of liquid. Fill the dry-cell vessel with this solution and allow it to remain until the blotting paper is completely saturated.

Obtain a good size electric-light carbon, about $\frac{5}{8}$ in. in diameter, and file one end down as shown. Drill a hole through the carbon and mount a terminal.

Make a mixture of equal parts of finely powdered carbon and manganese dioxide of sufficient amount to almost fill the vessel. Add to this mixture some of the solution and thoroughly mix them. Continue adding solution until a thick paste is formed.

Pour the solution out of the vessel and allow the latter to drain for a few minutes in an inverted position. Place the carbon rod in the center of the vessel and pack the paste down around it, being careful not to move the carbon rod from its central position. The vessel should be filled with the paste to within about $\frac{5}{8}$ in. of the top. The lower end of the carbon rod should not be nearer the bottom of the vessel than $\frac{1}{2}$ in. Over the top of the paste place

a mixture of equal parts sand and fine sawdust and then, over this, a layer of pitch, which acts as a seal for the cell. A layer of blotting paper should

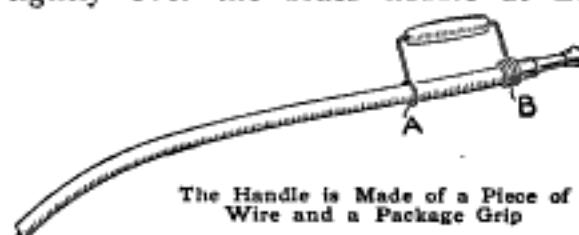


Cross Section through the Cell, Showing the Construction and Location of the Parts

be placed between the sand-sawdust mixture and the carbon-manganese mixture. The side lining of the vessel should be turned in before the sand-sawdust mixture is placed in the top of the cell. The outside of the cell should be covered with some heavy pasteboard, which will serve to insulate the negative terminal from the surface upon which the cell rests.

A Hose-Nozzle Handle

A handle for a garden-hose nozzle is easily made of a piece of wire and the wooden part of a package carrier. The wire is bent to receive the hose at A, and, after the handle is slipped on, the other end is formed to fit tightly over the brass nozzle at B.

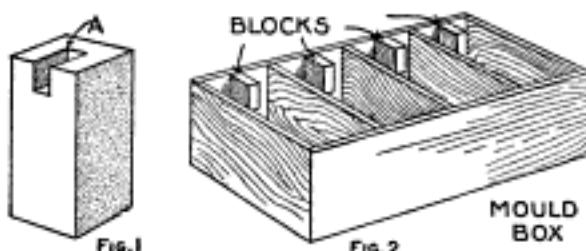


The Handle is Made of a Piece of Wire and a Package Grip

The hose nozzle can be easily carried with the handle, which will keep the hand dry.—Contributed by F. G. Marbach, Cleveland, O.

Anchor Posts for a Lawn Swing

A very substantial and convenient base for a lawn swing can be made by using four anchor posts of cement, as

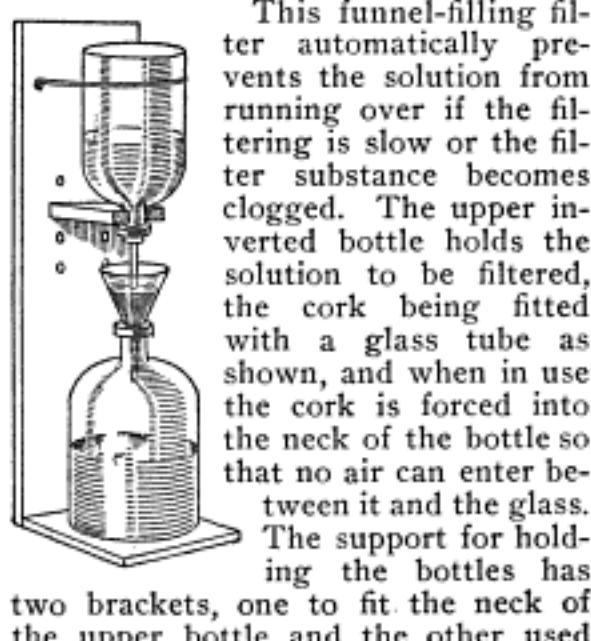


An Anchor Post of Cement and a Mold Box for Shaping Four Posts at a Time

shown in Fig. 1. The posts are made with a recess, A, to receive the legs of the swing, and of any suitable size. They may be placed with the upper face on a level with the lawn, or higher if desired.

A rough mold box, Fig. 2, lined with paper, will do for making the posts. The box does not require any top or bottom; it is simply placed on a board and lifted away when the blocks are thoroughly dried. If the blocks are leveled when placed in the earth, the swing may be taken down and erected again without the usual leveling and bracing.—Contributed by James M. Kane, Doylestown, Pa.

Automatic Filter

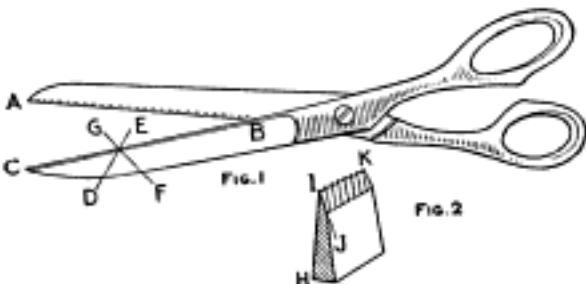


two brackets, one to fit the neck of the upper bottle and the other used

as a shelf for the receiving bottle. In operation, the solution runs from the upper bottle into the funnel, holding the filter paper, but it cannot fill the funnel completely, because the end of the glass tube is lower than the edge of the funnel, and as soon as the liquid in the funnel covers the end of the tube, all inflow of air into the upper bottle is stopped, and, thereby, further flow of the solution into the funnel prevented, until enough has filtered through to uncover the end of the tube and thus permit air to again enter the upper bottle.—Contributed by G. Simons, Chicago.

Grinding Scissors

Whether a pair of scissors be ground or filed, the marks or scratches left from the contact with the abrasive should all extend across the bevel in



The Direction of the Grinding Tool should be Slightly Sloping Toward the Handles

the direction of the line ED, Fig. 1, and never in the direction of the line GF. If the cutting edge be examined under a magnifying glass, the tool marks or scratches left by the sharpening process will be very plainly seen, and where these scratches intersect with the face HI, Fig. 2, of the blade, they will appear as teeth along the cutting edge IK.

As a pair of scissors close, the natural tendency is to thrust the material to be cut out of the angle ABC, Fig. 1, but if these small teeth formed on the cutting edge point in the direction of the line ED, this slipping action is prevented or retarded because the fibrous material adheres to the fine teeth on the cutting edge of the blades.

Wet paper, silks, mohair cloths, etc., can be sheared with perfect ease and

dispatch, when scissors are sharpened in this manner. The same principle holds good for metal snips.

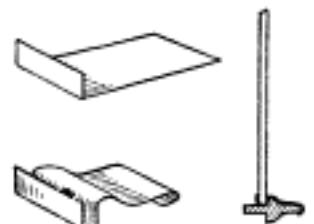
The angle HIJ, Fig. 2, varies according to the material to be cut, and the type of shear. A greater angle is required on metal shears than on shears for domestic uses.—Contributed by A. Clifton, Chicago.

To Repair a Leak in a Canoe

After striking some rocks with our canoe, it sprung three very bad leaks. These were effectively patched with pieces of cheesecloth, well soaked in liquid shellac, which were pasted on the outside of the leak. After allowing this to set for a few hours, it will be almost impossible to remove the patch. This is an inexpensive and almost invariably a sure remedy for leaks. When the cloth is dry, paint it over with the same color as the boat, and the repair can scarcely be seen.—Contributed by William B. Smith, New York City.

Holder for Loose Window Glass

When the putty becomes loose and the glazing points work out on window glass, temporary repairs may be made by using a small piece of tin or sheet iron bent as shown in the sketch. The clip is inserted under the edge of the glass and hooked over the back of the sash parts. This will hold the glass firmly in place and also prevent rattling.



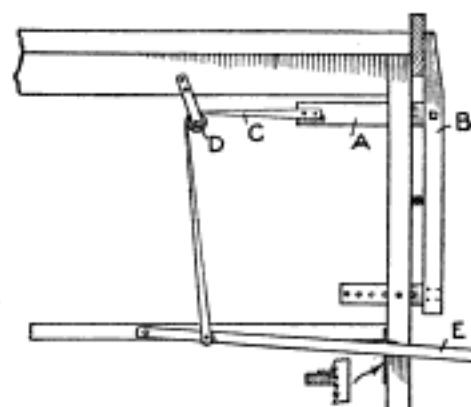
A sufficient number of holes are drilled in the edge of the cover to make a strainer.

A Homemade Bench Vise

A form of a bench vise that can be easily made and attached to a work-bench is shown in the illustration. This vise requires no screw, and the parts can be made from scrap material.

The substitute A for the screw is a

rectangular piece of wood and is fastened with a tenon in a mortise cut in the vise jaw B. The clamping ar-



The Vise Jaw as It is Attached to the Bench and the Substitute Screw Arrangement

angement consists of a strap, C, attached to the piece A, then run over a pulley, D, and fastened to a foot pedal, E. The foot pedal is fulcrumed on a crosspiece of the bench and has a ratchet so as to hold it when the vise is set. The lower end of the vise is fitted with the usual form of device for parallel adjustment. A coil spring is located in the center for use in quickly opening the vise when the foot pedal is released.—Contributed by A. C. Westby, Porter, Minn.

A Cover Strainer

Quite frequently the cook or housewife wishes to pour the hot water or liquid from boiling vegetables or other foods without removing the solids from the kettle. This is easily accomplished, if small holes are drilled in the cover as shown in the sketch. The saucepan or kettle can be tilted and the liquid drains through the holes. Further, the steam from cooking food



A Sufficient Number of Holes are Drilled in the Edge of the Cover to Make a Strainer

can readily escape through the holes, thus preventing the cover from vibrating, or the liquids from boiling over.

Picture-Frame and Triangle Clamp

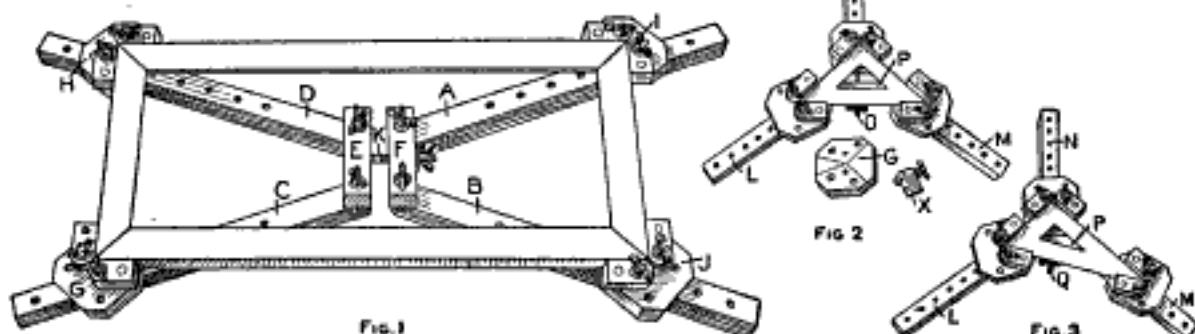
A picture frame or triangle is quite difficult to hold together when fitting the corners. It is still more difficult to hold them together while the glue dries. The clamp illustrated will be found quite satisfactory in solving this problem, and at the same time is very simple to construct and easy to manipulate. The material list for making the clamps and corner blocks is as follows:

Picture frame clamp:
4 pieces, $\frac{1}{4}$ by $\frac{1}{4}$ by 15 in.
2 pieces, $\frac{1}{4}$ by $\frac{1}{4}$ by 5 in.
Triangle clamp:
3 pieces, $\frac{1}{4}$ by $\frac{1}{4}$ by 10 in.
1 piece, $\frac{1}{4}$ by $\frac{1}{4}$ by 4 in.
Corner blocks:
4 pieces, $\frac{3}{8}$ by $\frac{3}{8}$ by $\frac{3}{4}$ in.
8 pieces, $\frac{3}{8}$ by 1 by 2 in.
The pieces mentioned are of oak, S4S.
1 piece $\frac{3}{8}$ -in. maple for dowels
Hardware:
10 bolts, $\frac{1}{4}$ by 2 in.
4 bolts, $\frac{1}{4}$ by 3 in.
2 bolts, $\frac{3}{8}$ by 6 in.

The picture-frame clamp consists of the four arms A, B, C and D, Fig. 1. A $\frac{1}{4}$ -in. hole is bored in one end of each piece, $\frac{1}{2}$ in. from the end. A series of $\frac{3}{8}$ -in. holes, 1 in. apart, are bored along the center in each piece. The two short pieces, E and F, have two $\frac{1}{4}$ -in. holes bored in their centers, $\frac{1}{2}$ in. from each end. These pieces are bolted to the four arms with $\frac{1}{4}$ -in. bolts as shown in the sketch. A $\frac{3}{8}$ -in. hole is bored in the middle of

it with the end projecting $1\frac{1}{4}$ in. on the under side and level with the surface on the upper side. Each of the corner blocks is fitted with two pieces like X, Fig. 2. Each of these pieces has one end round or a semicircle, and in its center a $\frac{1}{4}$ -in. hole is bored. The other end has a $\frac{3}{8}$ -in. hole bored $\frac{1}{2}$ in. from the end.

After making the small pieces, take the four corner blocks G, H, I and J and draw a line on the upper side in the center, with the grain of the wood, and mark the angles as follows, so that one-half the angle will be on each side of the centerline: On one end of the pieces G and H mark a 90-deg. angle, on the other end a 45-deg. angle, on the piece I mark a 90-deg. and 30-deg. angle and on J mark a 90-deg. and 60-deg. angle. Mark the number of degrees of each between the sides of the angle. Place two of the pieces marked X, Fig. 2, on each of the corner blocks, one piece on each side between the different angle lines, so their round ends will be toward the center and toward each other with a space of $\frac{1}{4}$ in. between them. Clamp the pieces to the corner blocks and bore the $\frac{1}{4}$ -in. holes through them to secure perfect alignment. Put the bolts in and turn



The Corner Blocks on Both Picture Frame and Triangle Clamps are so Constructed That They Hold the Molding together While Fitting the Corners and also Hold Them Securely While the Glue is Hardening

each piece E and F for one of the 6-in. bolts K.

The four corner blocks G, H, I and J, Fig. 1, have a $\frac{3}{8}$ -in. hole bored in the center of each and a dowel glued into

the pieces first to one angle and then the other, and while in the respective positions, bore the $\frac{3}{8}$ -in. holes $\frac{3}{8}$ in. deep in the corner blocks. Glue a dowel in each $\frac{3}{8}$ -in. hole of the small

pieces, allowing it to project $\frac{1}{4}$ in. on the under side so it will fit in the $\frac{3}{8}$ -in. hole in the corner block. Be sure to countersink the holes for the heads of the bolts. All bolts should be fitted with wing nuts. All that is necessary to change from one angle to another is to loosen the nuts and swing the small pieces around so the dowel pins will drop into the other holes, then tighten the nuts.

The triangle clamp is made in the same manner as the picture-frame clamp, except that the arms L and M, Figs. 2 and 3, are half-lapped into the crosspiece P. The bolt O is $\frac{3}{8}$ in. and the head is cut off. Drill a $\frac{1}{8}$ -in. hole in the bolt, $\frac{1}{4}$ in. from the end, and bore a $\frac{3}{8}$ -in. hole in the end of the arm N. Insert the headless bolt O in this hole and drive a nail through the side of the arm N, so it will pass through the hole drilled in the bolt. This keys the bolt in the end of the arm N.

To clamp a picture frame, set the corner blocks G, H, I and J to the 90-deg. angles and adjust them on the arms A, B, C and D to accommodate the size frame to be made, as shown in Fig. 1. Tighten the thumbnut on the bolt K, and this will draw all four corners together with the same pressure. The corners can then be examined to see if they fit properly. If they do not, saw in the joints with a backsaw until they do fit.

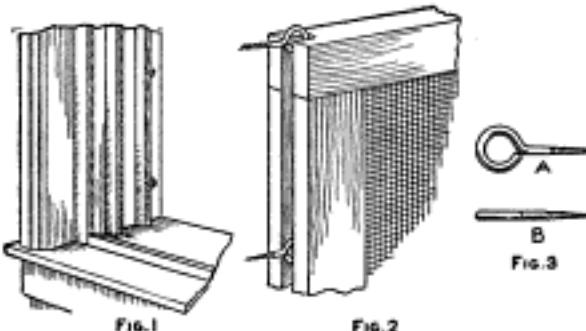
The triangles are clamped in the same way. The corner blocks are set to take the proper angles. The ends of the bolts should be slightly burred over so that the thumbnuts cannot be turned off.—Contributed by Chas. A. Pettit, Baltimore, Md.

Exterior Sliding Fly Screen

The method shown for fitting fly screens on the outside of the upper and lower sash permits the screen to be raised and held at different heights. Screweyes are turned into the outer strips, as shown in Fig. 1. The sides of the screen frame are grooved, Fig.

2, to allow it to slide up and down on the screweyes.

The screen can be raised and two of the screweyes turned from the normal vertical position, A, Fig. 3, to a hori-



The Heads of the Screweyes in the Window-Frame Stop Slide in a Groove Cut in the Screen Frame

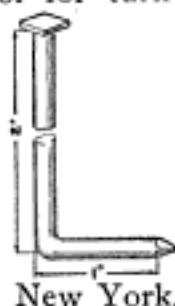
zontal position, B, to hold the frame at that point. By the use of a greater number of screweyes more places can be provided to support the screen at different heights.—Contributed by James M. Kane, Doylestown, Pa.

Bushing a Stovepipe in a Chimney Hole

When a stovepipe is too small for the hole in the chimney, a bushing can be made of the kind of metal tobacco boxes that are curved to fit in a pocket. Remove the tops and bottoms of the boxes and shove them in around the pipe. If such tobacco boxes are not at hand, tin cans of any kind can be used by melting off the tops and bottoms and bending the remaining cylindrical shells into proper shape.—Contributed by Elmer McConaughy, Dayton, O.

A Screweye Driver

An ordinary wire nail, 3 in. long, bent as shown and with its head filed square, makes a good tool for turning in screweyes. The square head is readily held in the chuck on most braces. The screweye can be turned in with greater speed than by the ordinary method.—Contributed by Robert T. Johnston, Buffalo, New York.



Supporter for a Double Clothesline

A double clothesline of any length should have a supporter in the center to keep the line from sagging when the clothes are hung on the lower one. The supporter shown in the sketch saves the wear from the strain on the lines. It also keeps the clothes in a higher current of air so that they dry quicker.

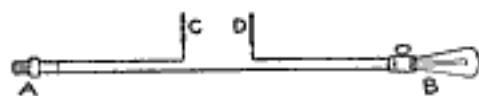
The supporter is made of two nickel-plated rings measuring 2 in. in diameter. They are bound together as shown. The rings being nickelplated, the supporter will not rust the clothes. The clothes should be arranged on the lower line so that the supporter will rest in the center.—Contributed by Katharine D. Morse, Syracuse, New York.

Pincushion for the Arm

Those that have trouble in keeping the pincushion within reach while sewing, can remedy the trouble by making one to fit the wrist or arm. An ordinary pincushion is attached to a piece of cardboard and an elastic sewed to the cardboard edges so that it will fit on the arm. The pincushion is not in the way and is readily worn so that the pins are easier to reach than if pinned to the dress.—Contributed by Frank Sterrett, Portland, O.

Electric Test for Fixtures

A very useful device for testing out fixtures before they are connected up



One Line of the Two Connecting Wires is Broken and the Ends Used as Terminals on the Fixture

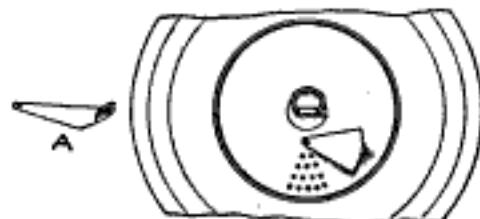
can be easily made as follows: Two wires are run from a plug, A, one to a socket, B, and the other to terminate

at C. The line from the other side of the socket B terminates at D.

In testing a fixture, the plug A is turned into a socket of some source of current, and a lamp is turned into the socket B. The terminal C is held to the metal covering of the fixture, while the end D is held to one of the wires. If there is a leak of current, the lamp at B and those of the fixture will light up.—Contributed by Fred Schumacher, Brooklyn, N. Y.

Opening for Steam in a Utensil Cover

When cooking certain foods the ordinary cover on a vessel confines too much steam, while if no cover at all is used, too much will escape, hence a cover which is provided with a vent is very desirable. The cover attachment shown in the illustration is evidently well adapted for service on such occasions and can be easily made as follows:



The Small Triangular Surface Provided with Holes for Releasing Surplus Steam is Covered with a Cap

Lay out a small triangle on some level part of the cover and punch several holes inside of the lines. Cut a cap, A, from a piece of tin to cover the holes. A small projection on the edge of the cap serves to swing it one way or the other, as needed, and it is fastened loosely to the cover with a soft-copper rivet, so that it may be easily opened.

Drying Seeds

A good way to dry tomato, cantaloupe, and other seeds is to put them on blotters. They will quickly dry in this manner and will not become moldy, as the blotter soaks up the moisture.—Contributed by Theodore Becker, Kansas City, Mo.

A Dissolving Coin Trick

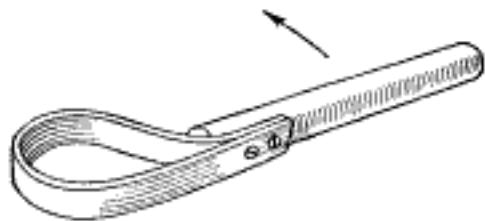
This is a very simple and effective trick. The articles required to perform the trick are, a glass of water, a silver dollar, a handkerchief and a watch crystal, or round piece of glass, the size of a silver dollar. Conceal the crystal in the palm of the hand and show the audience the dollar. Hold the handkerchief in one hand and place the hand holding the silver dollar and crystal under it so that the crystal can be grasped by the hand holding the handkerchief. Remove the dollar by holding it in the palm of the hand and slip it, unobserved, into a pocket.

Ask some one in the audience to hold the handkerchief with the inclosed crystal and ask him to let it drop into the glass of water as the handkerchief covers both. The falling glass can be heard, but upon removing the handkerchief nothing can be seen of the dollar or watch crystal. The circular glass disk cannot be seen in the water.—Contributed by Albert Biery, Spokane, Wash.

A Fruit-Jar Opener

The accompanying sketch shows a handy device for turning up and unscrewing the covers on glass fruit jars. The loop is slipped over the cover and the handle turned in the direction of the arrow. To unscrew the cover, the tool is turned over and the handle turned in the opposite direction.

The loop should be just large enough to slip over the cover easily.



The Loop in the Leather Grips the Cap Tightly When the Handle is Turned as the Arrow Indicates

It is made of leather and fastened to the wood handle with screws.—Contributed by J. B. Downer, Seattle, Wash.

Anti-Tangle Safety Pin

A small disk of rubber or leather, placed on a safety pin as shown in Fig. 1, will prevent the fabric which is fas-



Fig. 1

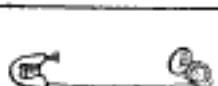


Fig. 2

The Small Disk on the Pin Prevents the Goods from Becoming Tangled in the Coil

tened by the pin from becoming tangled in the spring loop. The manner of using the pin is shown in Fig. 2.

How to Nickel or Silverplate Iron by Friction

The following methods of plating iron with nickel and silver appeared in a recent issue of a German paper. In nickelplating iron, a thin coating of copper is first produced on it by rubbing on a solution of 20 parts sulphate of copper, 5 parts sulphuric acid and 100 parts of water. After the copper plate has been formed rub over it, with a rag, a solution of 3 parts tin, 6 parts nickel and 1 part iron in 100 parts of hydrochloric acid and 3 parts of sulphuric acid. If finally the object is rubbed with a rag that has been dipped in finely pulverized zinc, a nickel deposit will be formed on the copper. The thickness of the deposit of nickel can be increased by repeating the two last operations.

According to a recent patent, a silver coating can be produced by dissolving freshly precipitated chloride of silver in a solution of hyposulphite of soda, 1.1 parts to 10 parts of water, and adding to this solution 180 parts spirits of sal ammoniac and then stirring in 800 parts of finely washed chalk. This mixture is applied and rubbed until it dries on the object being silvered, and the result is a brilliant deposit of pure silver.

A good filling for cracks in old furniture is made of shellac, either melted by heat or dissolved in alcohol to make a thick paste.

POPULAR MECHANICS

INTERESTING PATENTS,
PRACTICAL OR UNIQUE

PLATES WITH CUTLERY GROOVES (British patent)—A plate having grooves to receive knives, forks and spoons on the border or rim and to retain them there until required by the user is shown in Fig. 1. The idea is particularly designed for the self-serving type of restaurant.

RESILIENT DRIVE FOR MOTORCYCLES—In Fig. 2 is shown an interesting resilient or elastic driving arrangement for motorcycles, made possible by loosely mounting the sprocket wheel on the drive-wheel hub. Plunger rods are pivoted to the sprocket wheel, and operate in casings pivotally connected with the rim of the wheel. Springs are provided to exert tension upon the plunger rods.

SEED-CORN STRINGER—A simple stringer for seed corn is illustrated by Fig. 3. The operation of the top bar causes the crossheads at the inner ends of the lower bars to move simultaneously across each other and back, thus causing the corn-supporting strands to cross and recross over the ears of corn.

MUDGUARD FOR SHOES (British patent)—A rear mudguard for shoes is shown in Fig. 4. It consists of a properly shaped piece of leather or rubberized fabric permanently attached to the shoe between the heel and the upper. It may be turned up so as to lie flat against the upper when not in use, and is provided with a clip for retaining it in this turned-up position.

SWIMMING SADDLE—Figure 5 illustrates a swimming apparatus having a form that vaguely reminds one of a Mexican saddle. It is, in fact, a water saddle in which an inexperienced swimmer may ride the waters in safety. A weighted keel keeps the device upright, with the front and rear buoys floating on the surface, and the remainder of the apparatus under water. The user straddles the saddle, with the body bent forward and the chin resting on the un-submerged portion in front.

REVERSIBLE GLOVE—An idea that would seem to be particularly adaptable for baseball gloves is illustrated by Fig. 6. It is a reversible glove; that is, a glove which can be worn on either the right or the left hand. This is made possible by the provision of two thumbs, each of which has an outside pocket into which it can be tucked when not in use. The glove is shown in the drawing as used for the left hand.

SEPARATE STALL FOR BIG TOE (British patent)—The chafing of the big toe against its nearest neighbor among the little toes, often the cause of bunions or corns, has caused an English inventor to design Oxfords, slippers and sandals with a separate stall for the offending "big brother." In the case of the sandal, the big toe slips into a separate strap, but in the Oxfords and slippers a separate soft-leather compartment is provided.

CAN WITH SELF-CLOSING COVER—Lack of care in replacing the cover of the garbage can, with the result that such a can becomes a fine open-air restaurant for swarms of flies, makes the self-closing lid shown in Fig. 8, or some similar contrivance, particularly advisable for such receptacles. A pull on the handle of this self-closing cover causes it to move straight upward until free of the can-body and then swing away from the can to render the latter accessible. When the grip on the handle is released, the cover automatically swings back and descends onto the can, closing it tightly.

POTATO DIGGER (British patent)—The rotary potato digger shown in Fig. 9 is provided with a rotary brush which sweeps the earth displaced by the soil-breaking plow point within reach of the rotating forks, which lift out the potatoes.

NUT-GRIPPING VEHICLE WRENCH—A wrench which saves considerable time and trouble in greasing buggies is shown in Fig. 10. A spring grip takes substantial hold of the axle nut when the wrench head is engaged with it, keeping the wrench from slipping off the nut.

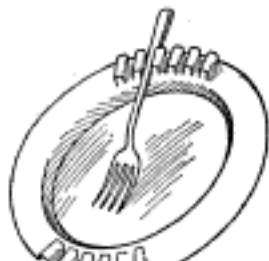


Fig. 1

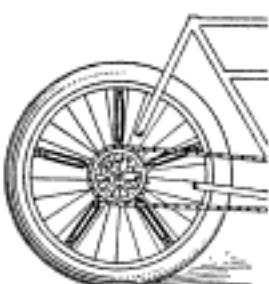


Fig. 2

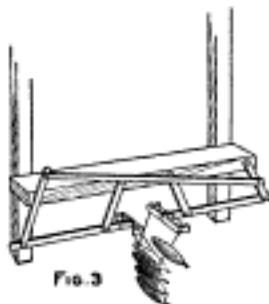


Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7

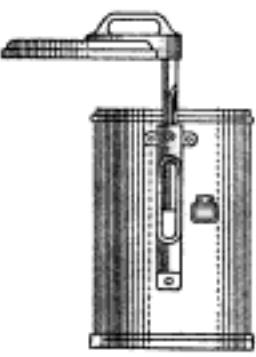


Fig. 8

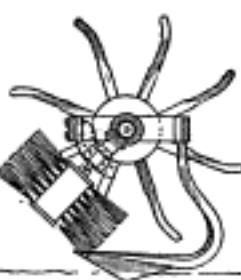


Fig. 9



Fig. 10



Fig. 11



Fig. 12

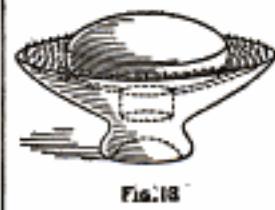


Fig. 13

ADJUSTABLE CLEANING BRUSH FOR BOTTLES (French patent)—Figure 11 illustrates a new French bottle-cleaning brush with which it is possible to reach the interior of bottles of almost any shape. The lower brush is pivotally attached to the stem or handle of the upper, the stem being a hollow tube inclosing a screw. Midway of the tube is a cut-out or hole so that the user may reach the screw with thumb and forefinger in order to alter the inclination of the adjustable brush.

A BUNTING BASEBALL BAT—A baseball bat which has a feature that makes it particularly adaptable for bunting, without, it is claimed, making it in any way inferior to the ordinary bat, is shown in Fig. 12. The two slots extending lengthwise from the striking end for about a third of the total length of the bat contain nonresilient strips, such, for instance, as cardboard. When the bat is held so that the ball is struck with the cardboard strips lying edgewise to it, the force of the rebound of the ball is claimed to be substantially the same as that obtained with the ordinary bat, but when the ball is struck with the plane of the cardboard strips presented to the ball the resultant rebound is considerably deadened.

COMBINED SOAP DISH AND FLESH BRUSH (British patent)—Figure 13 shows a combined flesh brush and soap dish made of india-rubber. The studded rim of the bowl forms the brush. In the center of the bowl, under the soap, is a well into which the water drains when the device is used as a soap dish, and which may contain a washing mixture when it is used as a brush. The base of the bowl is formed with a vacuum cup to hold the device upright.

INGENIOUS TRACK LEVEL—A simple little level, which saves the section foreman from leaning over the rail to sight the level of the track, and which may be carried in the pocket, is illustrated by Fig. 14. It is claimed that with this level the section foreman can sight from 30 to 125 ft. of track by simply attaching it to the track and standing over it. In looking into the glass, he will see lines, running crosswise of the glass, which must be directly over each other and on a line with a small target placed between the two points he wants to have level. It saves the labor of stooping over so often and kneeling on damp, cold ground.

SIDE STEERING GEAR FOR AUTOMOBILES—Figure 15 is of interest because of the similarity of the steering mechanism to that of a boat. The steering wheel, attached to the outside of the driver's seat is genuinely nautical in appearance. The wheel is turned by means of the spoke handles extending from the rim of the wheel.

MAGNIFYING ATTACHMENT FOR SPECTACLES (British patent)—The combining of a magnifying glass with ordinary spectacles in such manner that the former may be readily moved into and out of the line of vision is shown in Fig. 16. The magnifying glass is mounted in a frame similar to that of the spectacles, and this frame is hinged to a block secured to the hinge bracket of the spectacles by a screw. This block, which is shown in the smaller drawing, is provided with a hole that passes over the arm of the spectacles.

LOCK FAUCET—A means of preventing waste of water through faucets located in more or less public or accessible places is shown in Fig. 17. A spring-pressed bolt normally locks the faucet plug in closed position, but the operation of the key withdraws the bolt from its hole and permits the rotation of the plug to open the faucet.

FLOATING COUCH (British patent)—This drawing (Fig. 18) shows a floating couch designed particularly for invalids undergoing a water cure, and also as a comfortable floating device for bathers. It is made in three sections, hinged together. The middle or seat portion is provided with vertical side frames inclosing air cushions, and the head portion also carries air cushions. Cords, passing over pulleys, connect the head and foot sections, so that the user can raise the head-supporting frame and lower the foot section by pressure of the feet, thus gaining an upright position.

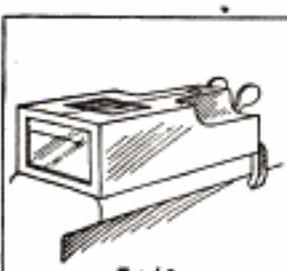


Fig. 14

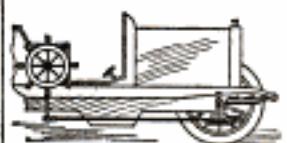


Fig. 15

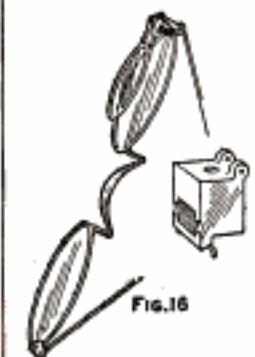


Fig. 16

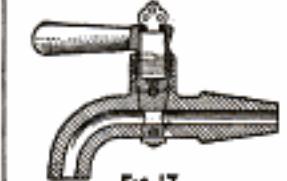
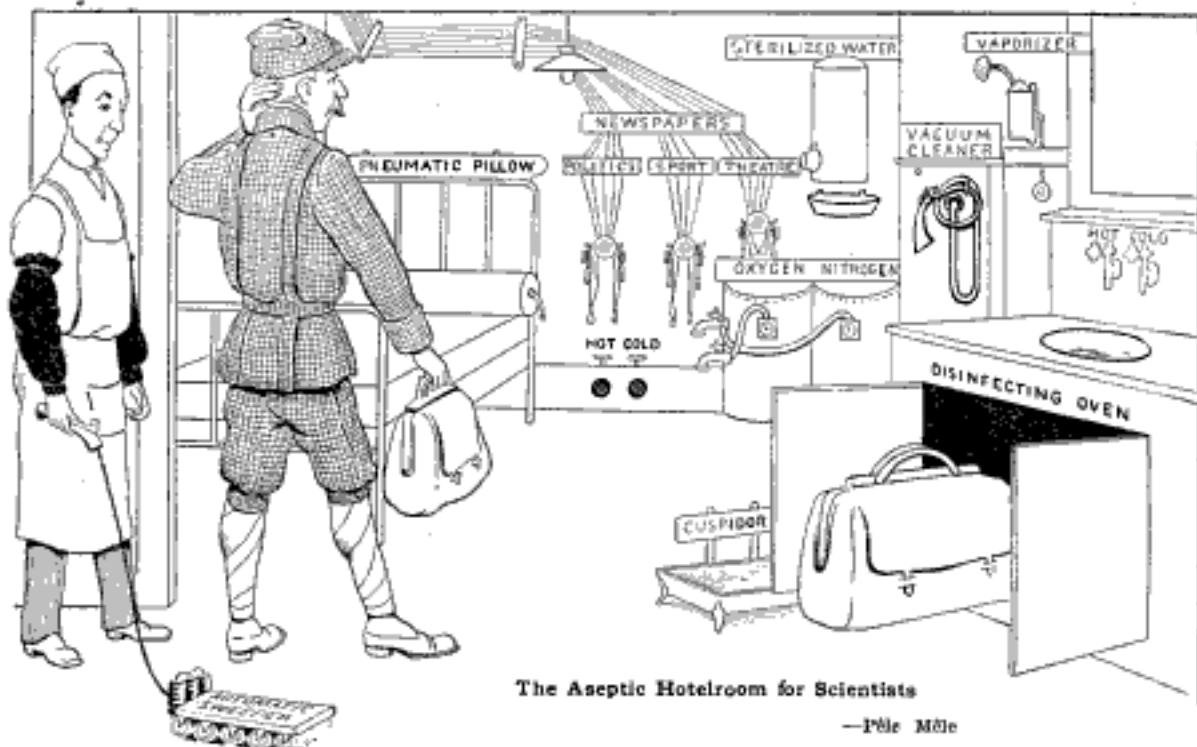


Fig. 17



Fig. 18



"I JUST saw your wife in your neighbor's auto. Why don't you take her out in yours?" "Oh, we've just made our wills in favor of each other."—*The Motor Age*.

Grocer—"What are you doing there?" Clerk—"Mr. Jones has ordered a bushel of potatoes, and I'm looking him up in Bradstreet."—*The Railway Age-Gazette*.

Small Boy—Pa, how did they first discover iron? Pa—I have heard that they smelt it.—*The Country Gentleman*.

Gibbs—"I can't find 'acroplane' in this dictionary."

Dibbs—"Have you looked on the fly leaf?"—*Boston Evening Transcript*.

It was in the Intervale of the White Mountains. "What is the train schedule, Uncle Hi?" asked a tourist of the factotum of the small summer hotel, "between here and Portland?"

"Hit's this-a-way," was the drawling answer. "Take the stage, and it hits the train. Take the train, and it hits the boat. And hit starts at quarter after, half after, quarter to, and at."—*Forward*.

NEW BOOKS RECEIVED

HOW TO USE THE MICROSCOPE. A Guide for the novice—By Rev. Charles A. Hall, 88 pages, cloth, 5x7, 20 full-page illustrations, and 23 line drawings, indexed. Adam and Charles Black, London, The Macmillan Co., New York.

MODERN ILLUMINATION THEORY AND PRACTICE.—By Henry C. Horstman and Victor H. Tousley, 273 pages, 4 1/2 x 6 1/4, flexible leather, illustrated and indexed, \$2.00. Frederick J. Drake & Company, Chicago.

ELECTRICAL INJURIES. Their Causation, Prevention and Treatment—By Charles A. Laufer, A. M., M.D., 77 pages, 4 x 6 1/4, cloth, 50 cents net. John Wiley & Sons, New York.

PRACTICAL AERONAUTICS.—By Chas. B. Hayward, 709 pages, 6 1/2 x 9 1/2, cloth, 310 illustrations, \$3.50. Published by American School of Correspondence, Chicago.

HISTORY OF BRIDGE ENGINEERING.—By Henry Grattan Tyrrell, C. E., 479 pages, 6x9, cloth, illustrated and indexed, \$4.00. Published by the author, 540 Judson Ave., Evanston, Ill.

FARM GAS ENGINES.—By H. R. Brate, 195 pages, 5x7, cloth, illustrated and indexed, \$1.00. The Gas Engine Publishing Co., Cincinnati, Ohio.

MOLDING CONCRETE FLOWER POTS, BOXES, JARDINIERES, ETC.—By A. A. Houghton, and

MOLDING CONCRETE FOUNTAINS AND LAWN ORNAMENTS.—By A. A. Houghton, each 5x7, paper, 50c; being numbers 10 and 11, respectively, of "Concrete Workers Reference Books," published by The Norman W. Henley Publishing Co., New York.

RUBBER HAND STAMPS AND THE MANIPULATION OF RUBBER.—By T. O'Conor Sloane, A.M., E.M., Ph.D., 167 pages, 5x6 1/4, cloth, illustrated and indexed, \$1.00. The Norman W. Henley Publishing Co., New York.

PRIMER OF SCIENTIFIC MANAGEMENT.—By Frank B. Gilbreth, M.E., 108 pages, 5x7 1/2, cloth, indexed, \$1.00 net. D. van Nostrand Company, New York.

BUILDING AND FLYING AN AEROPLANE.—By Chas. B. Hayward, 142 pages, 5 1/2 x 8 1/2, cloth, illustrated, \$1.00. Published by American School of Correspondence, Chicago.

DIARY OF A ROUND HOUSE FOREMAN.—By F. S. Reilly, 158 pages, 4 1/2 x 6 1/2, cloth, \$1.50. The Norman W. Henley Publishing Co., New York.

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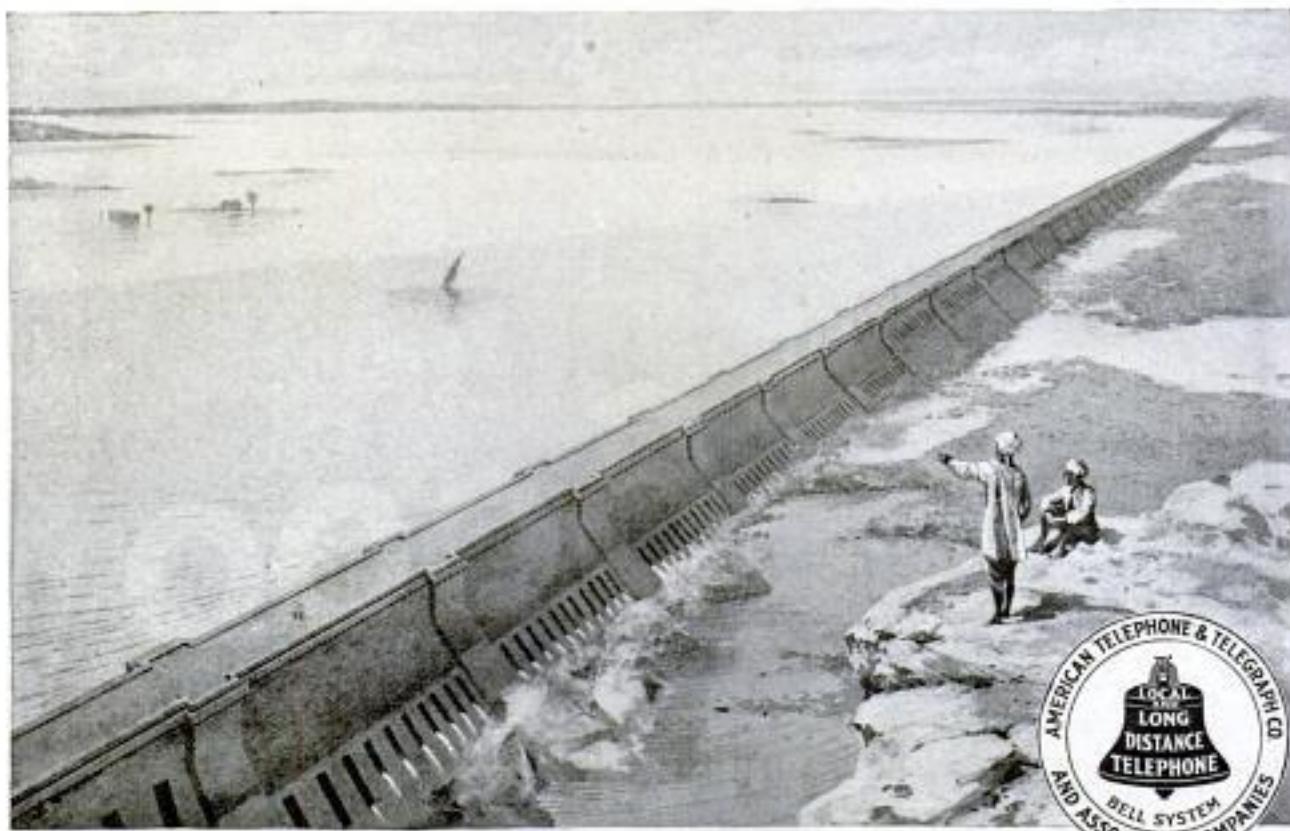
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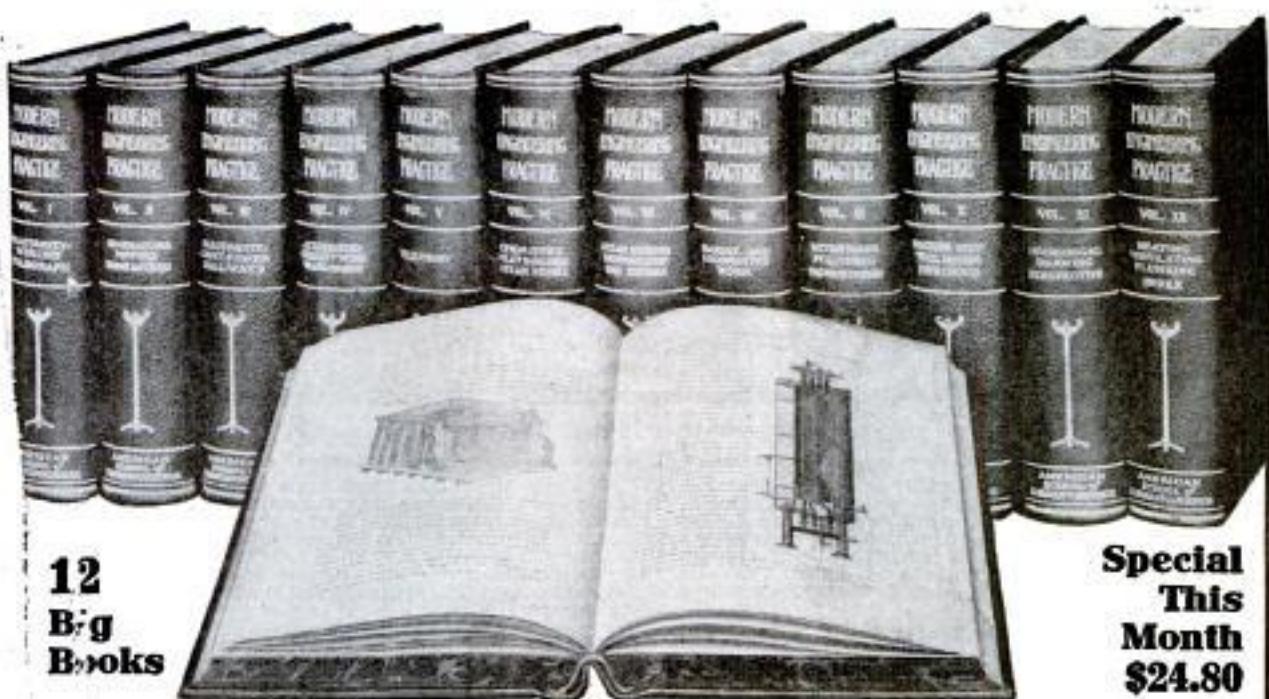
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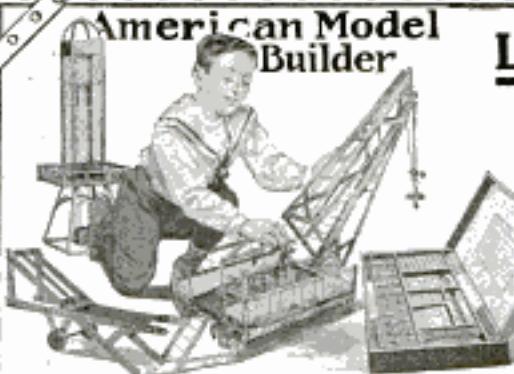
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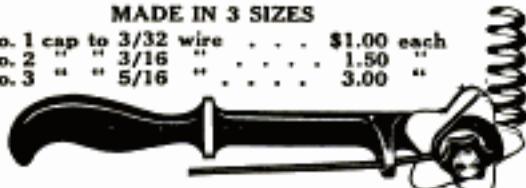
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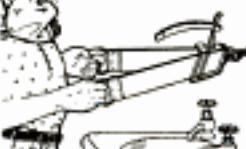
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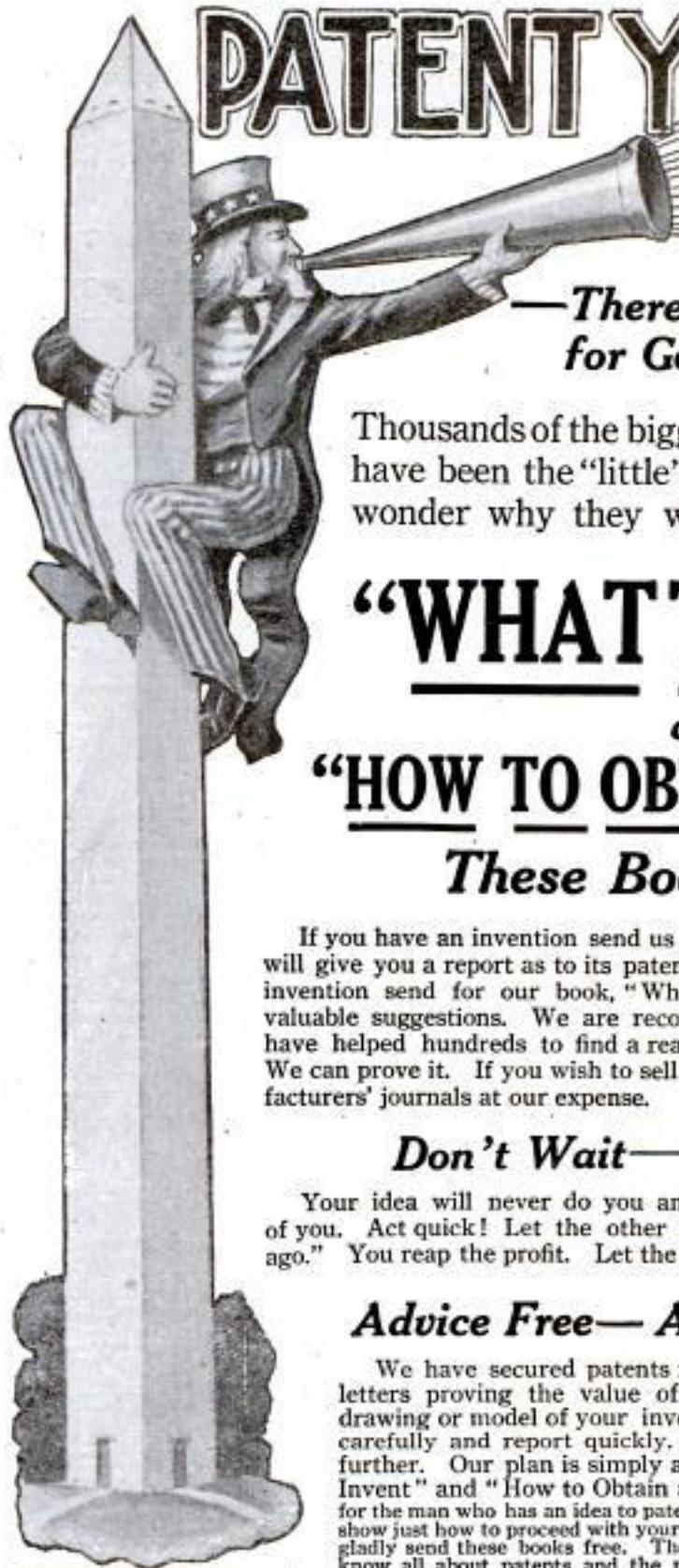


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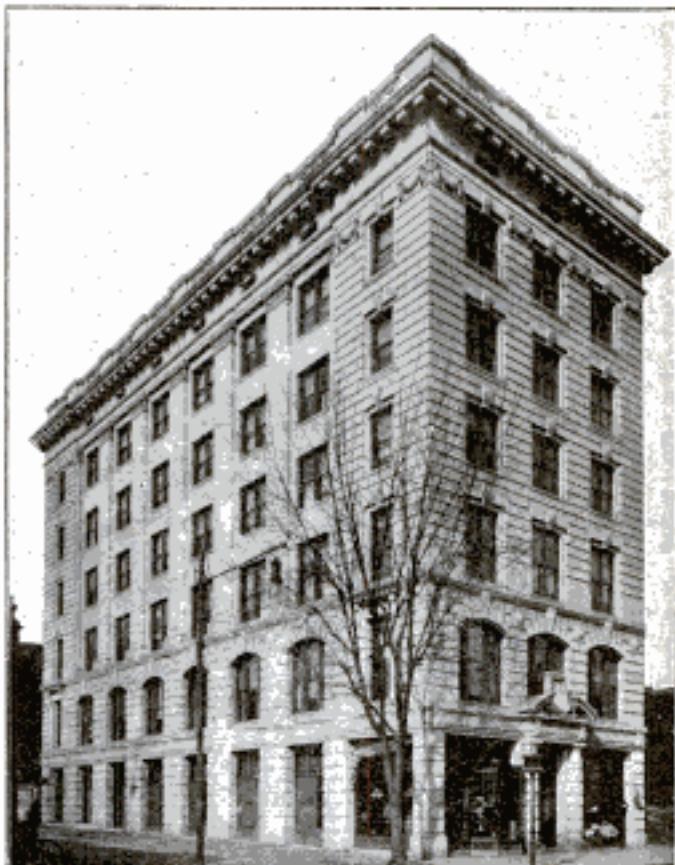
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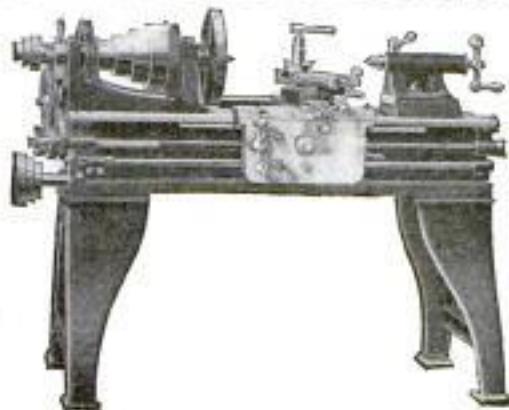
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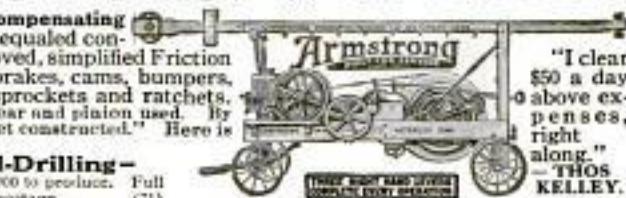
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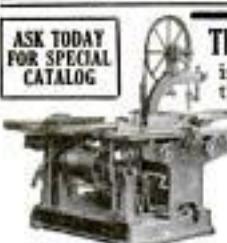
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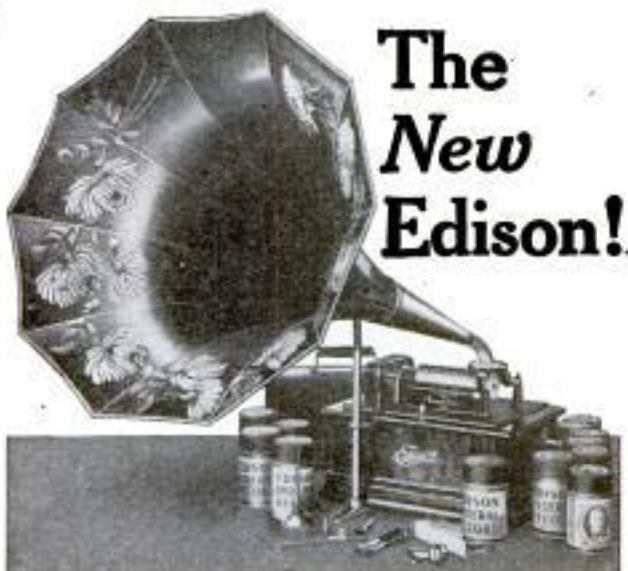
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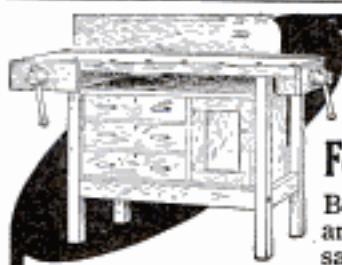
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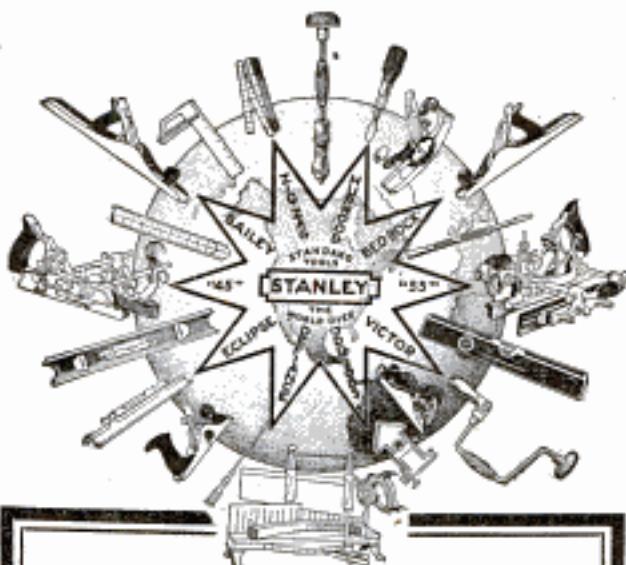


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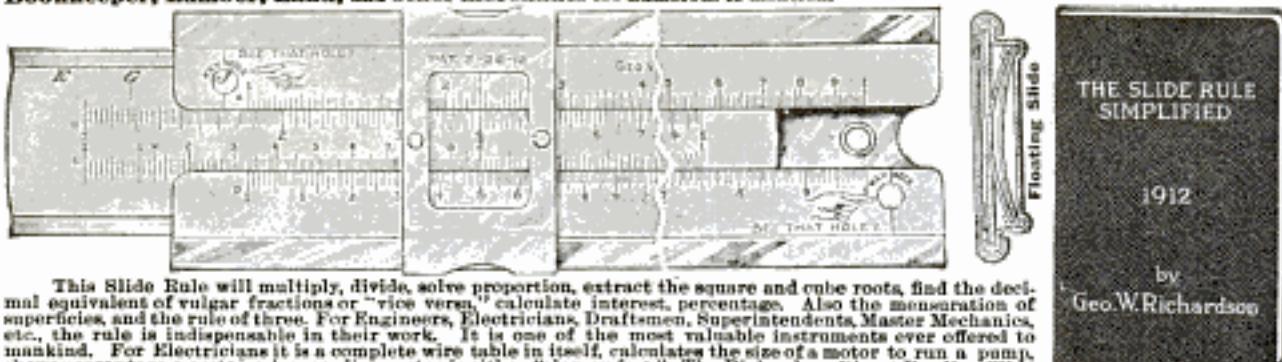
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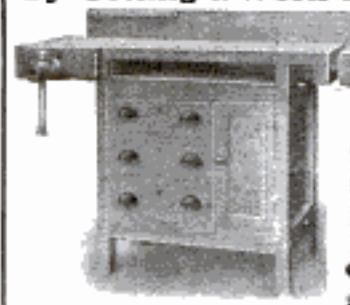
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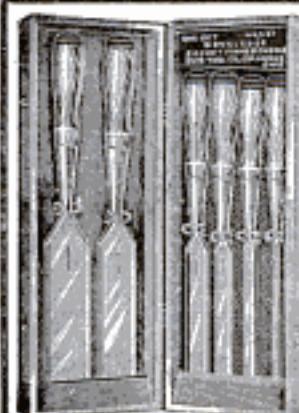
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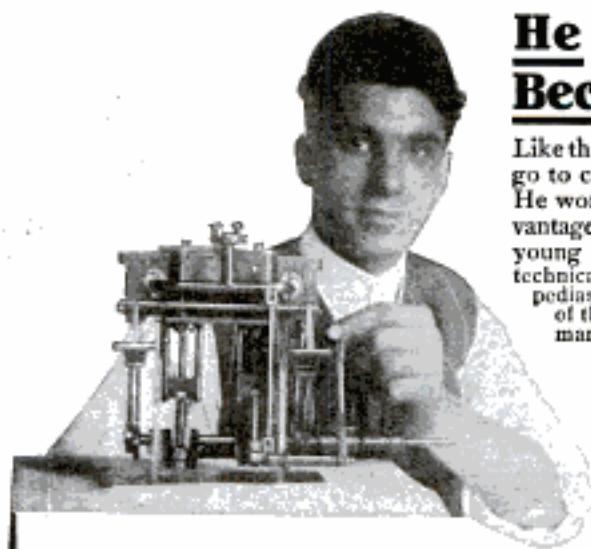
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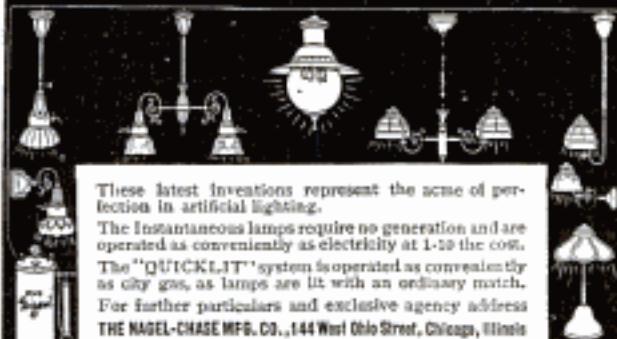
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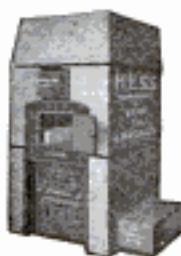


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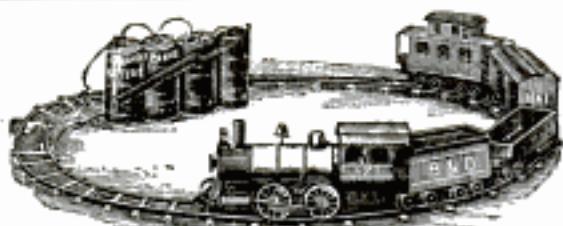


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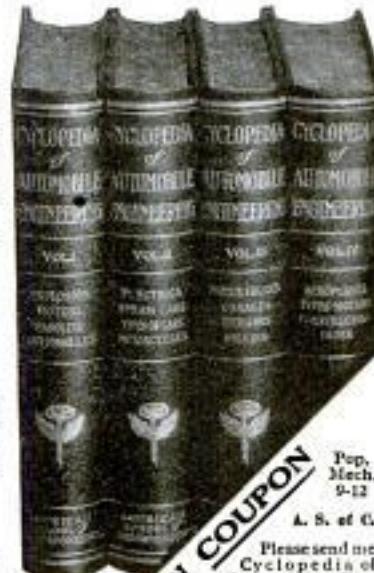
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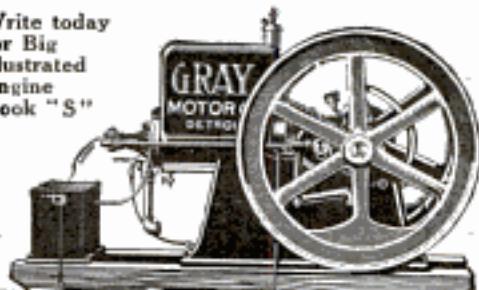
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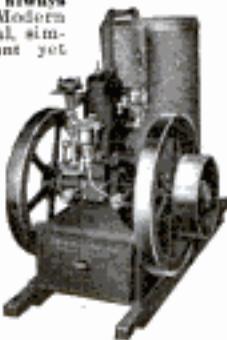
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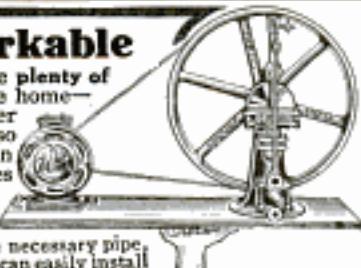


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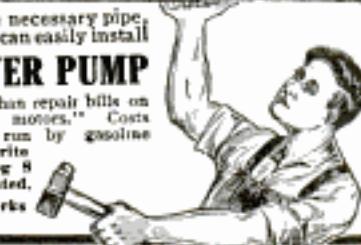
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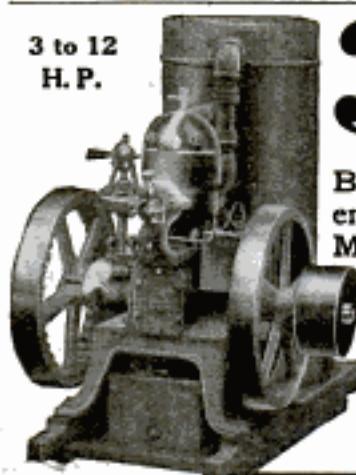


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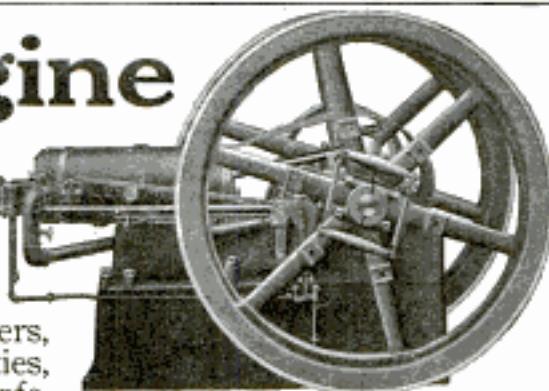
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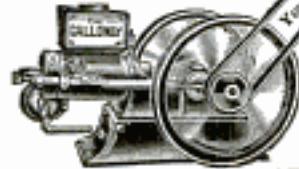
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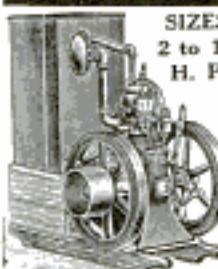


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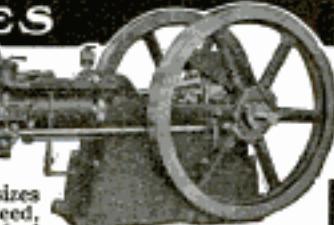


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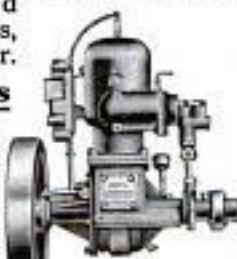
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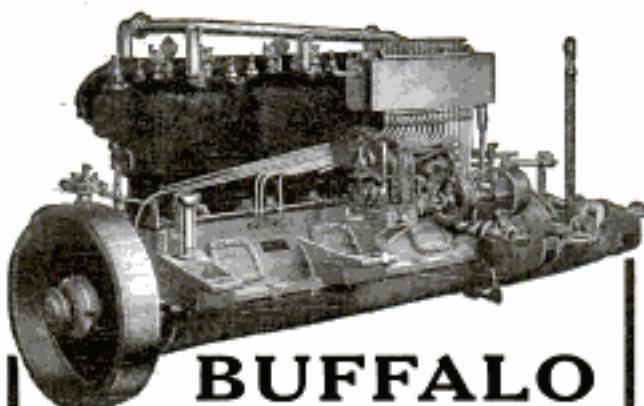
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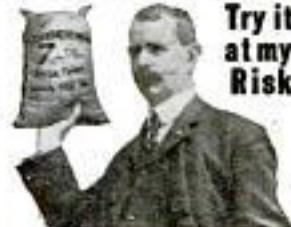
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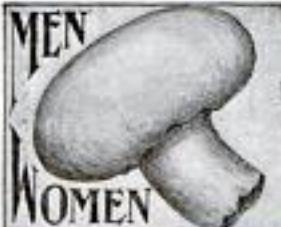
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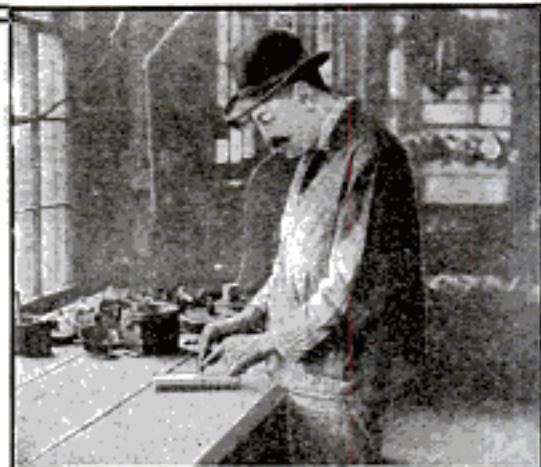
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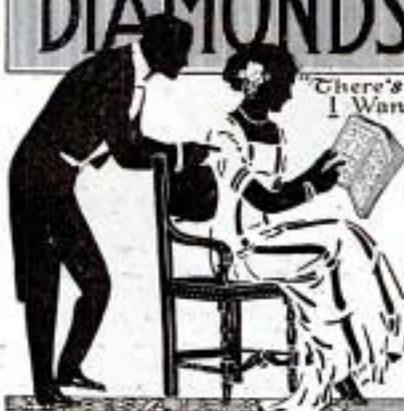


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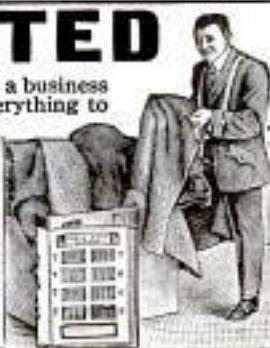
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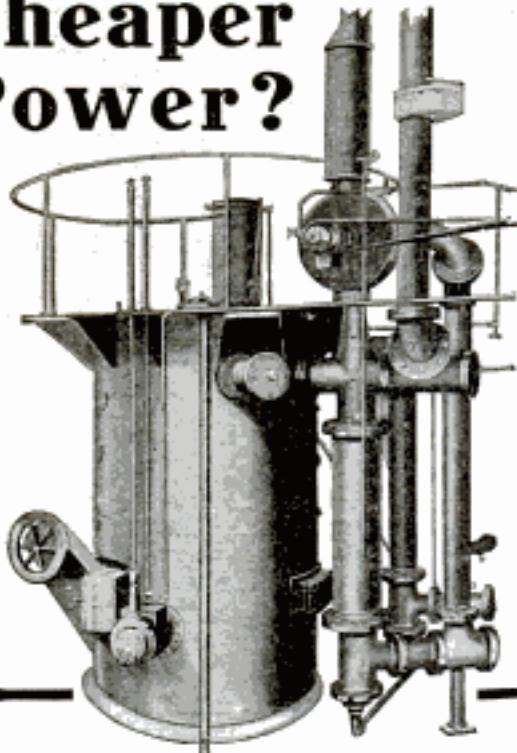
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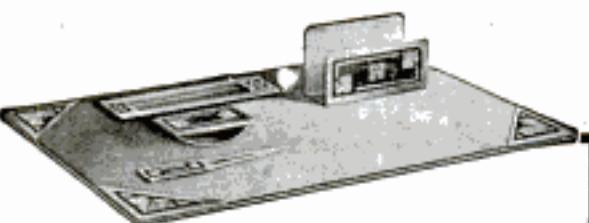
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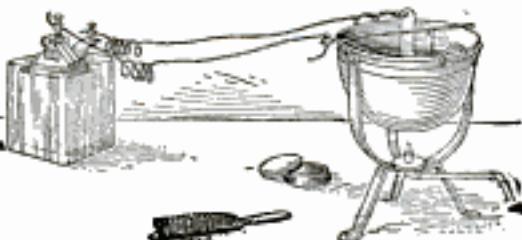
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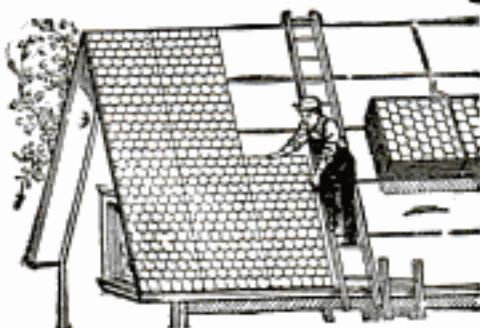
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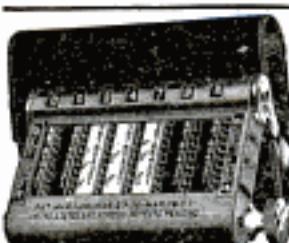
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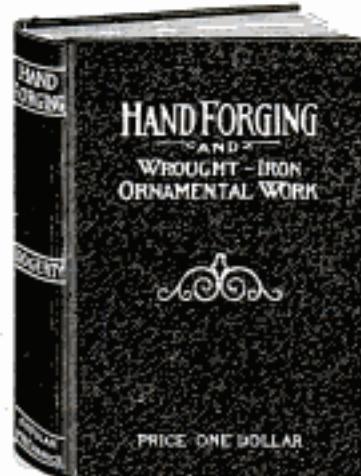
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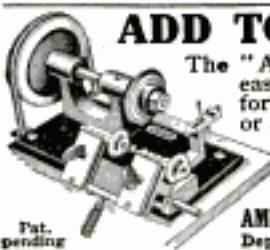
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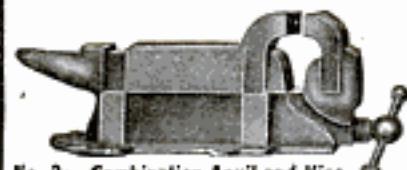
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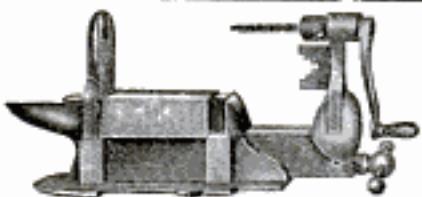
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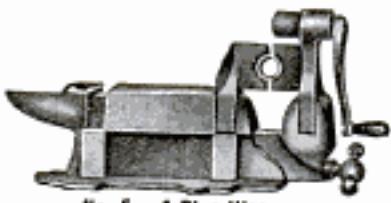
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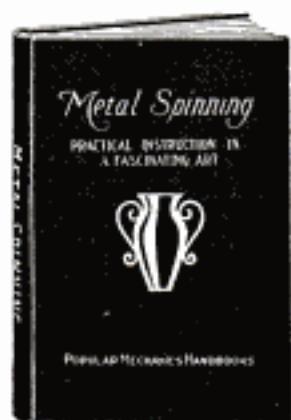
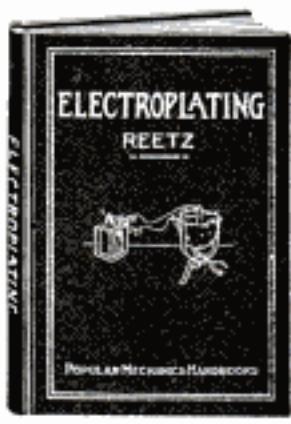
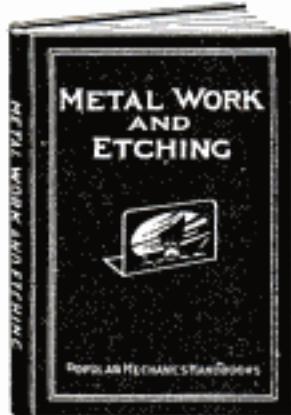
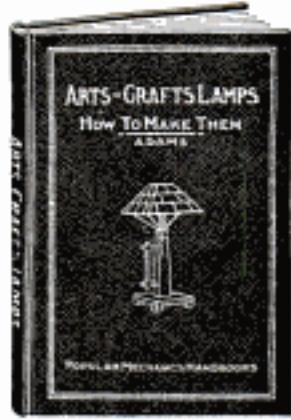
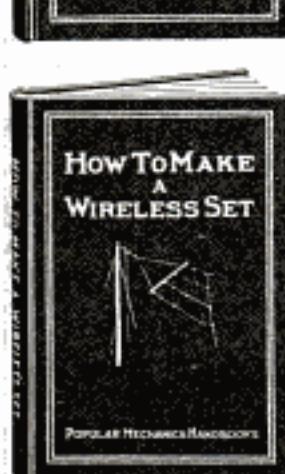
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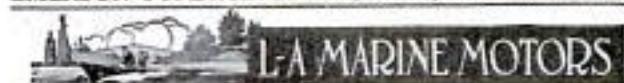
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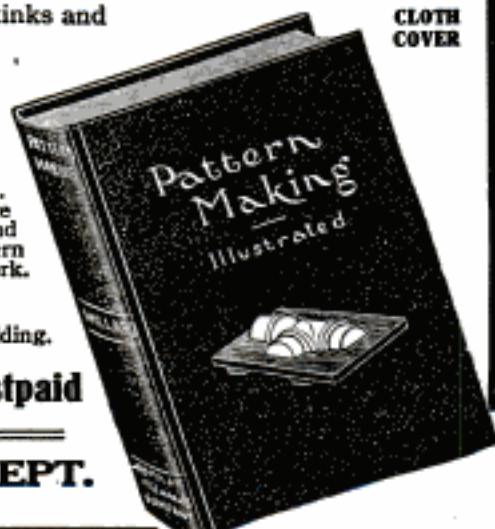
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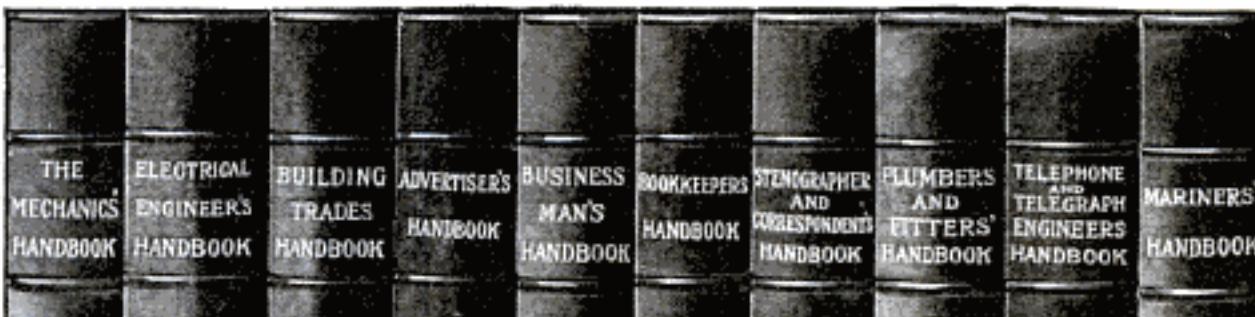
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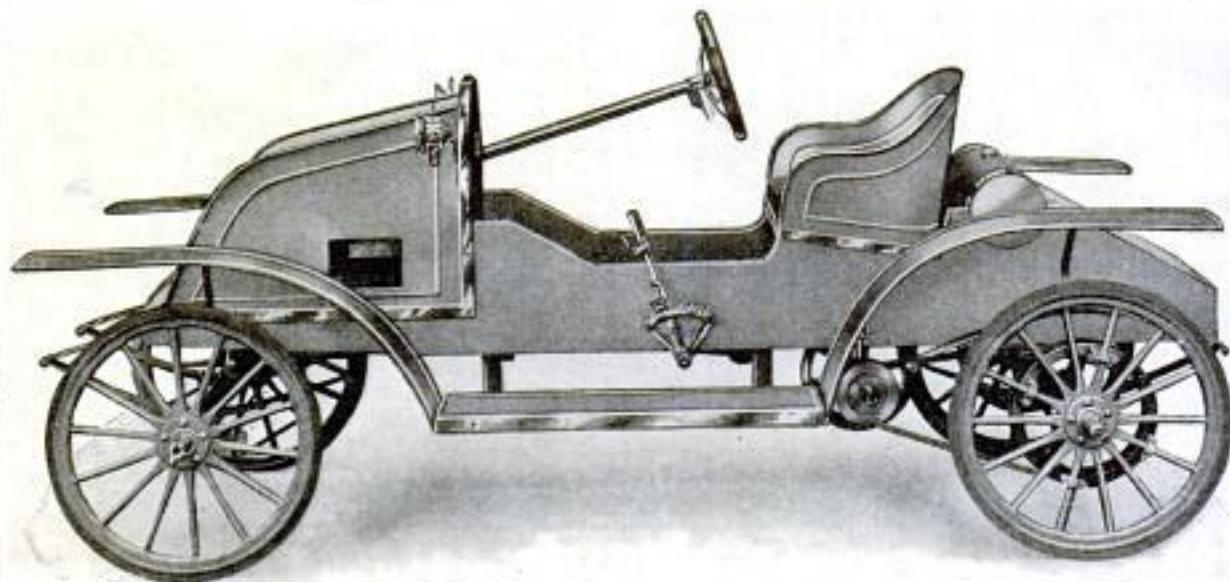
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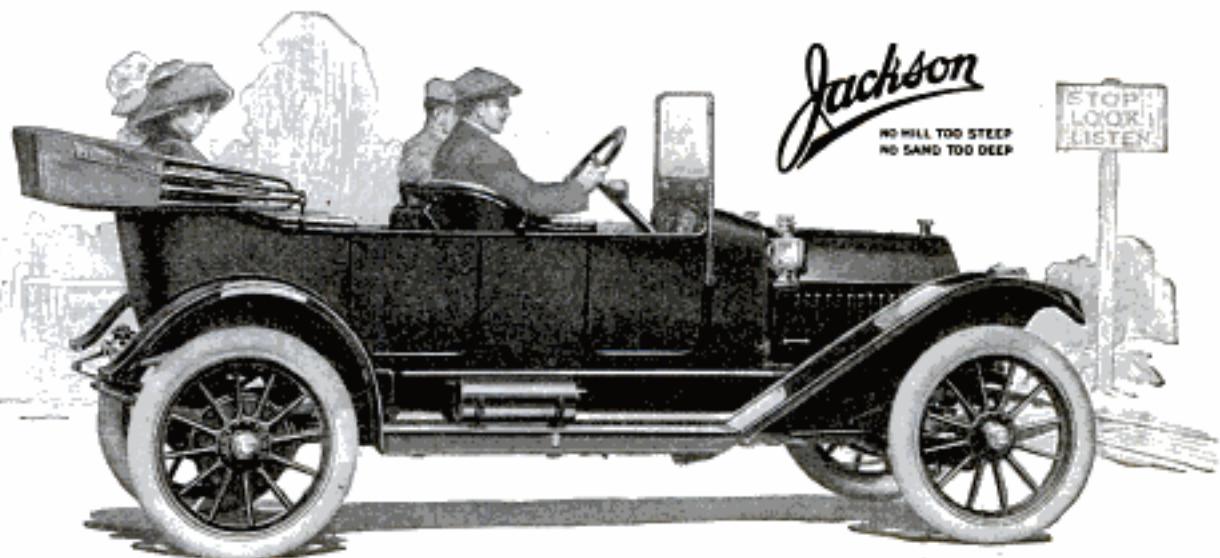
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Thus the Jackson "Olympic" places at your disposal the features which heretofore have made the costliest cars worth their prices.

We have made the upholstery luxuriously soft—10 inches deep.

We have made the seat backs shoulder high and tilted the seats slightly to the rear.

And the body is very wide—the sides extending beyond the wheels.

The spring action will be a revelation to you.

The four full elliptic springs possess from 33½ to 100 per cent more ability to absorb road shocks than the ordinary motor car types.

You actually have to listen to hear the "Olympic" motor run.

You hear no click or slap of valves, because they are perfectly adjusted and enclosed. You do not hear the fan because of its extra-long plain bearing. You do not hear even the carburetor's intake of air.

The transmission is quiet because both shafts are mounted on bearings of the separated-ball type, that run in a bath of oil.

The rear axle does not hum because the gears are of correct pitch, fitted to a thousandth of an inch. There is no interval between the transfer of the load from one tooth to the next; and the gears run between long-roller bearings, with ball thrust bearings to preserve perfect adjustment.

In power and durability we sincerely believe the motor to be the best in the world. It has proved out in the hardest sort of service, and in the severest road and track racing.

Your local Jackson dealer has a specimen "Olympic" model.

He will gladly help you corroborate all we have said here. Call on him; or write us for details and his name.

OTHER MODELS

The "Majestic" at \$1850 has a long-stroke (4½ x 5½) motor of 45 H. P. Its wheelbase is 124 inches; tires, 36 x 4 inches; springs, full elliptic, front and rear. It is equipped with self-starter, mohair top, top hood, windshield, speedometer, oil gauge and gasoline gauge on dash, demountable rims, extra rim, tire holder, electric horn, foot rail, coat rail, pump, tools and jack. It has powerful electric headlights with parabolic reflectors, flush dashlights (electric) and an electric tail lamp. The current for the lights is supplied by a dynamo driven by the motor which charges a storage battery for use when the motor is not running. The car has black and nickel trimmings.

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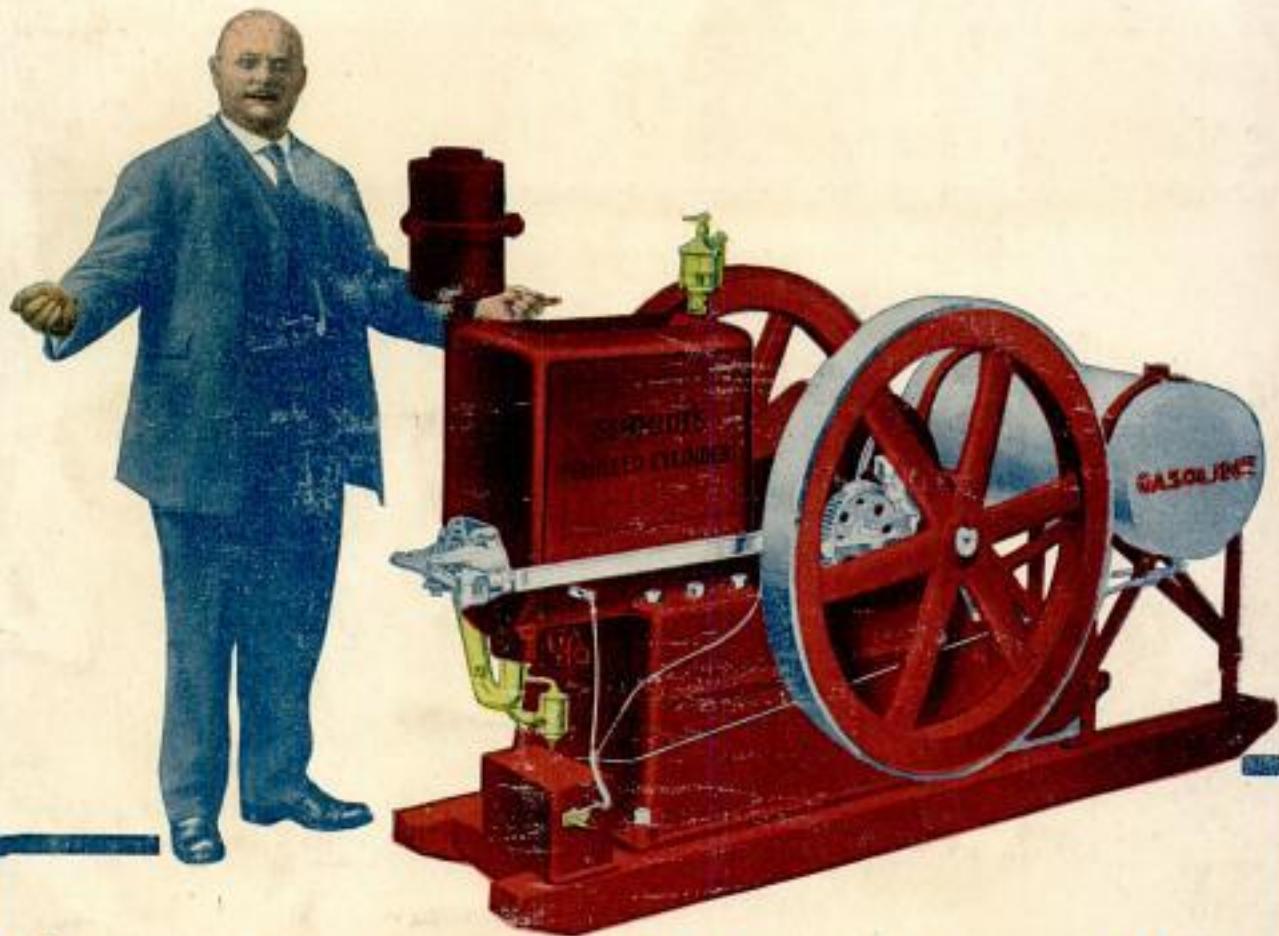
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